

AD-A105 903

FEDERAL AVIATION ADMINISTRATION WASHINGTON DC

F/G 9/5

ELECTRONIC EQUIPMENT, GENERAL REQUIREMENTS, SPECIFICATION FAA-G--ETC(U)

JUN 81

UNCLASSIFIED

NL

| OF |
AD-A
105 903



A
59

LEVEL



FAA-G-2100c
June 22, 1981

SUPERSEDING
FAA-G-2100/1b, 6/28/73
FAA-G-2100/2a, 6/19/68
FAA-G-2100/3a, 6/19/68
FAA-G-2100/4b, 2/05/69
FAA-G-2100/5a, 12/10/72

AD A105903

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
SPECIFICATION

DTIC
ELECTE
OCT 20 1981
H

ELECTRONIC EQUIPMENT, GENERAL REQUIREMENTS

Specification FAA-G-2100c

11/22 Jun 81

1363

1. SCOPE

1.1 Scope. - This specification covers the general requirements for the design and construction of ground electronic equipment. This specification establishes the ambient conditions within which equipment must operate satisfactorily and reliably; the general material, the process for selection and application of parts, and the tests for ground electronic equipment. Requirements applicable to individual equipments shall be as specified in the individual equipment specifications.

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

81 10 14

1 403270

2. APPLICABLE DOCUMENTS

2.1 Precedence of documents. - This specification shall have precedence over all specifications, standards, documents, etc., listed or referenced herein. In the event of conflict between the requirements of the equipment specification and this specification, the equipment specification shall have precedence.

2.2 FAA Documents. - The following FAA specifications and standards, of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

2.2.1 FAA Specifications

FAA-G-1210	Provisioning Technical Documentation
FAA-G-1375	Parts Peculiar for Electronic, Electrical and Mechanical Equipment

2.2.2 FAA Standards

FAA-STD-012	Paint Systems for Equipment
FAA-STD-013	Quality Control Program Requirements
FAA-STD-016	Quality Control System Requirements
FAA-STD-020	Transient Protection, Grounding, Bonding and Shielding Requirements For Equipment

2.3 Military and Federal publications. - The following Military and Federal publications, of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

2.3.1 Military Specifications

MIL-C-62	Capacitors, Fixed Electrolytic (DC, Aluminum, Dry Electrolyte, Polarized), General Specification For
MIL-G-1149	Gasket Materials, Synthetic Rubber, 50 and 65 Durometer Hardness
MIL-G-3036	Grommets, Elastic, Hot-Oil and Coolant Resistant
MIL-G-3787	Glass Laminated, Flat; (Except Aircraft)
MIL-C-5541	Chemical Films for Aluminum and Aluminum Alloys

Accession For
NTIS ☒ RA&I
DTIC TAB
Unannounced
Justification
By *file*
Distribution/
Availability Codes
Avail and/or
Special

A

MIL-S-8805/56	Switches Assemblies, Sensitive, Interlock Unsealed
MS9386	Packing, Preformed - AMS 7267, 'O' Ring
MS9388	Packing, Preformed - AMS 7278, 'O' Ring
MIL-P-15024	Plates, Tags and Bands For Identification of Equipment
MIL-F-15733	Filters, Radio Interference, General Specification For
MIL-G-16491	Grommet, Metallic
MIL-F-16552	Filters, Air Environmental Control System, Cleanable, Impingement (High Velocity Type)
MIL-E-17555	Electronic and Electrical Equipment, Accessories, and Repair Parts; Packaging and Packing Of
MIL-F-18327	Filters: High Pass, Low Pass, Band Pass, Band Supression and Dual Functioning, General Specification For
MIL-P-19834	Plates, Identification, Metal Foil Adhesive Backed
MIL-G-22529	Grommet, Plastic
MIL-D-23859	Delay Lines, Pulse, Electromagnetic, Fixed General Specification For
MS28900	Packing Preformed, For Electrical Use
MIL-M-38510	Microcircuits, General Specification For
MIL-P-55110	Printed Wiring Boards
MIL-S-83734	Sockets, Plug-in Electronic Components, General Specification For

2.3.2 Military Standards and Handbooks

MIL-STD-188	Military Communication System Technical Standards
MIL-STD-275	Printed Wiring for Electronic Equipment
MIL-STD-415	Test Points and Test Facilities for Electronic Systems and Associated Equipment, Design Standard For
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-470	Maintainability Program Requirements (For Systems and Equipments)

MIL-STD-785	Requirements for Reliability Program (For Systems and Equipments)
MIL-STD-965	Parts Control Program
MIL-STD-1313	Microelectronic Terms and Definitions
MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipment and Facilities
MIL-HDBK-217	Reliability Stress and Failure Rate Data for Electronic Equipment

2.3.3 Federal specifications.

F-F-310	Filter, Air Conditioning Viscous-Impingement and Dry Types, Replaceable
QQ-S-365	Silver Plating, Electro-deposited, General Requirements For
TT-E-527	Enamel, Alkyd, Lustreless
J-C-580	Cord, Flexible, and Wire, Fixture (Electrical, 0 to 600 Volt Service)
W-C-596	Connector, Plug, Electrical; Connector, Receptacle, Electrical

2.3.4 Federal Standards.

FED. STD. NO. 141	Federal Test Method Standard
FED. STD. NO. 595	Colors

2.4 Other publications - The following publications form a part of
this specification and are applicable to the extent specified
 herein.

ANSI C39.1-72	Electrical Analog Indicating Instruments, Requirements For
ANSI/EIA RS-310-C-77	Rack, Panels, and Associated Equipment
ANSI 315-75	Graphic Symbols for Electrical and Electronics Diagrams
ANSI 200-75	Reference Designations for Electrical and Electronic Parts and Equipments

FCC Rules and Regulations

Volume II, Part 2

Frequency Allocations and Radio

Treaty Matters; General

Rules and Regulations

Volume V, Part 87

Aviation Service

Volume X, Part 68

Connection of Terminal Equipment to the
Telephone Network

NEMA WD 1-79

General-Purpose Wiring Devices

NFPA 70 P-81

National Electrical Code

A limited number of copies of this FAA specification and other applicable FAA specifications may be obtained from the Contracting Officer in the Federal Aviation Administration office issuing the invitation for bids or request for proposals. Requests should fully identify material desired and should identify the invitation for bids, requests for proposals, contract involved, or other use to be made of the requested material. Other listed publications can be obtained as indicated.

Federal Specifications and Standards - General Services

Administration Business Service Centers in Atlanta;

Seattle, Washington; Boston; Chicago; Denver; Fort Worth;

Kansas City, MO; Los Angeles; New York; San Francisco; and

Washington, D.C.

Military Specifications and Standards - Naval Publicationsand Forms Center, 5801 Tabor Avenue, Philadelphia, PA
19120.ANSI Standards - American National Standards Institute,

Incorporated, 1430 Broadway, New York, NY 10018.

FCC Publications - Superintendent of Documents, U. S.

Government Printing Office, Washington, D. C. 20402.

NFPA Publications - National Fire Protection Association,

470 Atlantic Avenue, Boston, Mass. 02210

NEMA Publications - National Electrical Manufactures

Association, 2101 L Street, N.W., Washington, D.C. 20037

3. REQUIREMENTS

3.1 General. - The equipment shall reflect the optimum in simplicity, reliability, maintainability, energy efficiency, weight and ease of installation that is consistent with the needs of the Federal Aviation Administration.

3.2 Definitions.

3.2.1 Alternating current and voltage. - Unless otherwise specified in the contract, all alternating currents and voltages shall be understood to be root-mean-square (RMS) values.

3.2.2 Ambient temperature and ambient relative humidity. -The terms "ambient temperature" and "ambient relative humidity" are defined as the temperature and relative humidity of the air surrounding the equipment.

3.2.3 Continuous, unattended. - The term "continuous, unattended" means that, except for scheduled maintenance periods, determined by the Government, the equipment shall operate without interruption in accordance with all contract requirements and with no need that an attendant be present.

3.2.4 dBm reference power level. - The dBm zero reference level is defined as 0.001 watt.

3.2.5 Equipment models.

- a. Preproduction (prototype) model. - An item suitable for complete evaluation of form, fit, and performance. It is in final form in all respects, employs standard parts, or nonstandard parts approved by the Government, or combinations thereof, and is completely representative of final equipment.
- b. Production model. - An item in its final form of final production design made by production tools, jigs, fixtures and methods. It employs standard parts, or nonstandard parts approved by the Government, or combinations thereof.

3.2.6 Equipment specification. - An equipment specification is the detail or functional requirements covering a particular equipment or system.

3.2.7 Government inspection. - The term "Government inspection" as used in this specification means that an FAA or other delegated Government Agency representative will witness the contractor's testing and inspection, and will carry out such visual and other inspection as deemed necessary to assure compliance with contract requirements.

3.2.8 Hermetic sealing. - Hermetic sealing is the process by which an item is totally enclosed by a suitable structure or case by fusion of metallic, glass or ceramic materials. This includes the fusion of metals by welding, brazing, or soldering; the fusion of glass or ceramic materials under heat or pressure; and the fusion of glass or ceramic materials into a metallic support.

3.2.9 Interior and exterior. - The term "interior", when used herein, shall mean locations which must be reached through access doors of cabinets or consoles, through panel doors of chassis units, or by means of pull out or tilt chassis. The term

"exterior", when used herein, shall mean cabinet, console, or panel locations continuously exposed. Thus, a front panel of a chassis is interior where it is located behind a cabinet door, and is exterior where it is on the exposed outside surface of the cabinet.

3.2.10 Nominal Design Values for Ambient Temperature and Power Sources.-The parameters shown in Table I are defined as the standard design-center values for ambient temperature and power sources. Not all of the AC line voltages or DC voltages listed are necessarily applicable. Those voltages which are applicable will be specified in the equipment specification.

TABLE I
NOMINAL DESIGN VALUES

PARAMETER	STANDARD DESIGN-CENTER VALUE	TOLERANCE
Ambient temperature	+30°C	$\pm 10^{\circ}\text{C}$
AC line voltage	120 V	+ 2 V
	208 V	$\pm 3.5 \text{ V}$
	240 V	$\pm 4 \text{ V}$
AC line frequency	60 Hz	$\pm 0.5 \text{ Hz}$
DC voltage	48 V	+ 1 V
	24 V	$\pm 1 \text{ V}$

3.2.11 Normal test conditions. - The term "normal test conditions" is defined as a group of parameters from 3.2.10 above, consisting of the ambient temperature and the applicable voltages, with permissible tolerances as listed.

3.2.12 Paragraph number references. - Where a paragraph number is referenced (without qualification) herein, or in the equipment specification, only the specific paragraph so numbered shall apply. Where a group of paragraphs is referenced, such as "3.3.1.9 to 3.3.1.9.3", the word "inclusive" is implied whether or not actually stated. For example, "3.3.1.9 to 3.3.1.9.3" means "3.3.1.9 to 3.3.1.9.3 inclusive".

3.2.13 Parts and materials.

- a. Part. - One piece, or two or more pieces joined together, which are not normally subject to disassembly without destruction of designed use, such as a resistor, transistor, sealed bearing, bracket, etc.

- b. Standard parts and materials. - Standard parts and materials are those parts and materials specified herein and in the equipment specification as well as in other specifications which are applicable to the equipment specification.
- c. Nonstandard parts and materials. - All parts and materials not meeting the definition for standard parts and materials (3.2.13b) are defined as non standard.
- d. Parts Peculiar and Parts Common. - See FAA-G-1375.
- e. Program Parts, Selection List (PPSL). - A list of all parts approved for design selection in a specific contract. (Including standard and approved nonstandard parts).
- f. Military Parts Control Advisory Group (MPCAG). - A Department of Defense organization which provides recommendations to the military departments, including the Federal Aviation Administration and their contractors on the selection of parts in assigned commodity classes. (See paragraph 6.4 of MIL-STD-965).

3.2.14 Range of values. - Wherever a range of values is given, such as 230 V to 250 V, all values in the range including the terminal values are applicable.

3.2.15 Service conditions. - The term "service conditions" is defined as the group of parameters listed under Table I (Nominal Design Values) and Table II (Environmental Conditions). The applicable environmental conditions shall be as listed in Table II corresponding to the environment specified in the equipment specification.

3.2.16 Tolerances. - Where tolerance is specified as a percentage indicating a total variation without reference to a center value, this percentage shall be determined from the highest (H) and lowest (L) values obtained over the specified range, as follows:

$$\% = 200 (H-L) / (H+L)$$

3.2.17 Total harmonic distortion. - Total harmonic distortion is defined as the square root of the sum of the squares of the voltage amplitudes of the harmonic components, the voltage amplitudes of the harmonics being expressed as percentages of the amplitude of the fundamental.

3.3 Design and construction. - The equipment shall be designed to meet the requirements of the equipment specification and as specified herein. Approval shall be obtained from the Contracting Officer before committing any deviations from a specified design requirement.

3.3.1 General.

3.3.1.1 Accessibility. - Accessibility shall be in accordance with MIL-STD-454, Requirement 36. For nonstructural purposes all non-hinged shields or plates which are normally opened or removed in servicing an equipment shall be secured with quarter-turn fasteners, except where this type of fastener does not provide tight enough contact for RF shielding purposes. Such fasteners shall be spaced on centers not exceeding 10 inches and shall run around the entire periphery of the shields or plates.

3.3.1.2 Corona prevention. - Corona and electrical breakdown prevention shall be in accordance with MIL-STD-454, Requirement 45.

3.3.1.3 Electron tubes. - Electron tubes shall not be used unless specifically permitted by the equipment specification (see 3.5.9).

TABLE II
ENVIRONMENTAL CONDITIONS

Environ- ment	Temp. (°C)	Rel. Hum. (%)	Altitude (ft. above sea level	Wind (mph)	Ice Loading
I*	+ 10 to + 50	10 to 80	0 to 10,000	-	-
II**	- 10 to + 50	5 to 90	0 to 10,000	-	-
III***	- 50 to + 70	5 to 100	0 to 10,000	0 to 100	Encased in $\frac{1}{2}$ " radial thickness clear ice

* For equipment installed in attended facility

** For equipment installed in unattended facility

*** For equipment installed outdoors (antennas, field detectors, etc.)

Where wind and ice loading are specified for Environment III, the equipment shall withstand these combined factors without permanent deformation or change, or as otherwise specified in the equipment specification. For storage, shipping, or transporting (non-operating), the following requirements apply:

- | | |
|----------------------|---|
| a. Temperature | -50° C to +70° C |
| b. Relative humidity | Up to 100%
including
condensation
due to
temperature
changes |
| c. Altitude | 0 to 50,000 feet
above sea level |

3.3.1.4 Federal Communications Commission (FCC) Type Acceptance and Registration. - For communication, navigation and radio-determination equipment, the contractor shall obtain FCC Type Acceptance in accordance with FCC Rules and Regulations, Part 87, Aviation Services, and shall comply with 4.3.5 and 4.3.5.1 herein. For equipment designed for interface and connection to either the public or private telephone networks, the contractor shall obtain FCC Registration in accordance with FCC Rules and Regulations, Part 68, Connection of Terminal Equipment to the Telephone Network, and shall comply with 4.3.5 and 4.3.5.2 herein.

3.3.1.5 Grounding, Bonding, Shielding and Transient Protection. - Requirements for grounding, bonding, shielding and transient protection shall be as specified in FAA-STD-020 except section 7 shall not apply.

3.3.1.6 Human engineering. - Human engineering shall be in accordance with MIL-STD-454, Requirement 62.

3.3.1.7 Noise level limits. - Unless otherwise specified in the equipment specification, the noise level requirements shall apply to all co-located equipments being provided by the contractor (i.e., if the equipment or system being provided requires more than one rack of equipment in operation, the noise level limit requirement is applicable with all equipments operating simultaneously). Noise levels generated by the equipment, with motors, blowers, and all other sources of acoustic noise in full operation, shall not exceed the limits shown in Table III when measured at the point of highest noise level at a distance of three feet from the exterior surface of the equipment. Noise limits are expressed in dB with a reference pressure of 20 uPa (micro-newtons per square meter).

TABLE III

NOISE LEVEL LIMITS

FREQUENCY BANDS (Hz)	NOISE LIMITS (dB)
37.5 - 75	69
75 - 150	62
150 - 300	56
300 - 600	50
600 - 1200	47
1200 - 2400	45
2400 - 4800	43
4800 - 9600	42
9600 - 19200	41

3.3.1.8 Personnel safety. - Provisions for personnel safety shall be in accordance with MIL-STD-454, Requirement 1.

3.3.1.8.1 Protection from high meter voltages. - Not over 1500V, maximum peak value, shall exist between any terminal of each meter and the metal panel on which it is mounted in the equipment. This requirement shall apply throughout the service conditions with the equipment in operation at full rating, including all circumstances of parts failure and load removal. In case a meter will be subjected to voltages in excess of the foregoing, the meter shall be mounted on a panel of insulating material, and the panel shall be recessed behind a clear glass or plastic viewing window, so that operating personnel cannot touch the meter face.

3.3.1.8.2 Interlock bypass switch. - When interlock switches are used at voltages up to 500 volts, momentary action (spring-return) switches marked INTERLOCK BYPASS shall be provided to allow interlocked access doors and covers to be opened and the manual latch for "on" position to be operated in the exposed interlock switch, without removing power from the equipment. The bypass switches shall be located so that one person can operate the switch, open the door or cover, and set the manual latch. (See 3.5.33).

3.3.1.8.3 X-ray protection. - Shields, plates, covers, doors or other protective devices provided to meet the X-radiation protection requirements of MIL-STD-454, Requirement 1, shall be interlocked to remove the X-radiation when the protective device(s) are removed.

3.3.1.8.4 Parts cases. - Except for semiconductor and microelectronic devices, all outer metal cases of parts such as

capacitors, transformers, relays, etc., shall be at ground potential or covered by an external casing made of insulating material (see 3.6.8). The external casing shall enclose the original case on all sides except the terminal sides.

3.3.1.9 Thermal design. - Thermal design shall be in accordance with MIL-STD-454, Requirement 52, except that DC motors shall not be used for forced air cooling and air filters shall be in accordance with 3.3.1.9.1. An air-flow interlock shall be used to provide a visual or aural warning in the event of failure of the cooling device.

3.3.1.9.1 Air filters. - For equipment design requiring an air flow velocity through the filter not exceeding 300 FPM, disposable one inch thick impregnated glass wool filters per Federal Specification F-F-310, type I, Grade A or B shall be used; for air flow velocities through the filter exceeding 300 FPM, metal washable type filters in accordance with MIL-F-16552 shall be used. Air flow velocity through the metal filter shall not exceed 400 FPM. Filters shall not project outside the equipment enclosure and shall be removable from the outside (exterior) of the equipment cabinets without the necessity of opening access doors or moving any other equipment cabinets. Personnel shall be protected from harm from moving parts when replacing filters. Shutdown of fans shall not be required for filter replacement.

3.3.1.9.2 Pressure. - The ventilation design shall be such that the ventilated cabinet or console is maintained under a positive static pressure higher than the surrounding air pressure.

3.3.1.9.3 Exhaust air temperature. - The exhaust air temperature, measured inside the cabinet or console in front of the exhaust air vent, shall not exceed the input air temperature, measured outside the cabinet or console directly in front of the input air vent, by more than 15°C, with the equipment operating under normal test conditions.

3.3.2 Electrical. - All equipments and wiring shall be in accordance with the applicable portions of the National Electrical Code.

3.3.2.1 AC supply line: circuit and parts requirements.

3.3.2.1.1 AC line controls. - Each control switch, relay, circuit breaker, fuse or other device, which acts to disconnect the AC supply line energizing the equipment, shall be in accordance with the applicable portions of the National Electrical Code.

3.3.2.1.2 "Main power" switches. - Switches or circuit breakers which function as "main power" switches, operating either directly or through a contactor to disconnect the AC line from the equipment shall break the AC line immediately after it enters the equipment

via terminal block or connector, and before it reaches fuses or other parts.

3.3.2.1.3 AC line, input resistance to ground. - For each individual chassis unit which is to be connected to the AC supply line, the DC resistance to ground from each input line terminal shall be not less than 1 megohm (AC supply line disconnected; fuses in place; AC line control contacts closed).

3.3.2.1.4 Convenience outlets. - Where convenience outlets are provided on the equipment, they shall be a duplex isolated ground receptacle style NEMA 5-15R, such as Hubbell #IG-5262, Bryant #5262-IG, Slater #IG-5262, or approved equal. Equipment wiring facilities shall provide for connection of convenience outlets to an AC line power source independent of the equipment primary power source. The convenience outlets and wiring thereto shall be installed in accordance with the National Electrical Code.

3.3.2.1.5 AC line controls to be provided. - Each equipment unit which is energized by direct connection to the AC line shall have, as a minimum, the following AC line controls:

- a. Front-panel mounted "main power" switch or circuit breaker, permitting manual control of the application and removal of AC line voltage to the equipment. (See 3.3.2.1.1 to 3.3.2.1.3).
- b. Front-panel mounted AC line indicator light. (See 3.5.17).
- c. Front-panel mounted AC line indicating type fuse-holders, if circuit breaker not provided (See 3.5.12).

3.3.2.1.6 AC line receptacle and power cord. - Where a detachable power cord is provided on the equipment for connection to the 120V (nominal design value) AC supply line, the requirements below shall apply. Wiring and polarity shall be in accordance with the National Electrical Code.

- a. A midget locking, grounding type connector in accordance with Federal Specification W-C-596/75 shall be provided and mounted on the equipment. When practicable, the receptacle shall be on the lower right side of the rear of the equipment (when viewing the equipment from the rear).
- b. The power cord shall be type SJ, 3 conductor, in accordance with Federal Specification J-C-580. One end shall have a female connector in accordance with W-C-596/76-1; the other end shall have a male plug in accordance with W-C-596/13-3.

3.3.2.1.7 Transformer isolation, DC power supplies. - All DC power supplies energized from the AC line power source shall be isolated from the AC line through a power transformer with separate primary and secondary windings. The DC resistance from each input line terminal with fuses in place and AC line control contacts closed to the signal or chassis ground shall not be less than 1 megohm.

3.3.2.2 Circuit protection. - All equipment output circuits shall be so designed as to include circuit protection to prevent opens or shorts at the output terminals from damaging the equipment. When the short or open is removed, circuit performance shall show no sign of performance degradation. In addition, transmitter output circuitry shall be so designed that, when operated at any VSWR, the unit shall not be damaged nor any part exceed dissipation limits.

3.3.2.3 Communications and data exchange. - All equipments generating electrical signals that are to be exchanged through any communications link or for any distance over local or long distance communications networks shall comply with the applicable portions of MIL-STD-188.

3.3.2.4 Power source. - The specific values of nominal voltage and frequency (also number of phases and wires required) shall be as established by the equipment specification. The equipment shall be designed for continuous unattended duty unless specifically stated otherwise in the equipment specification or contract.

3.3.2.4.1 Electrical load balance. - When equipment requiring three-phase power is comprised of several single-phase subassemblies, the single-phase loads shall be balanced among the three phases so that the total load on any one phase does not deviate from the average of the three phases by more than ten percent.

3.3.2.4.2 Power factor. - The equipment shall be designed so that it presents a power factor not less than 80 percent lagging or 85 percent leading when operating under steady state conditions.

3.3.2.4.3 Effect of equipment on power source. - The total RMS current generated at service conditions by the equipment and fed back into an AC supply system with linear impedance characteristics shall not exceed 5 percent of RMS full load current.

3.3.2.4.4 Electrical overload protection. - Electrical overload protection shall be Class 1 in accordance with MIL-STD-454, Requirement 8, except that paragraph 4.4 of Requirement 8 is not applicable. (See 3.5.12).

3.3.2.5 Equipment operation under varying conditions of primary input power. - Except where otherwise specified herein, in the equipment specification/s, or in the contract, all specification requirements shall be met when the equipment is operated at the

specified duty and under all fixed or slowly varying combinations of AC line voltage and frequency, and DC voltage, as applicable, with the ranges of these parameters specified in Table IV simultaneously with the combinations of service conditions values of ambient temperature and ambient relative humidity provided in 4.11 hereof; and simultaneously over the service conditions range of barometric pressure. Under the same conditions, the specification requirement for voltages, currents, power dissipation and temperature, as applicable to specific parts and materials, shall not be exceeded in starting and operating the equipment.

TABLE IV

AC LINE PARAMETERS, DC VOLTAGE

(120 V)	102 V to 138 V	(+1 V)	**
(208 V)	177 V to 239 V	(+2 V)	**
(240 V)	204 V to 276 V	(+2 V)	**
AC line frequency (60 Hz)	57 Hz to 63 Hz	(+0.2 Hz)	**
DC voltage (48 V)	44 V to 52 V	(+0.5 V)	**

** NOTE: Where discrete values of the above frequency or voltages are specified for testing purposes, the tolerances given in parentheses shall apply to these parameters as they are indicated on the measuring instruments specified under 4.4 hereof.

3.3.2.6 Electromagnetic interference control. - Electromagnetic interference (EMI) control requirements shall be in accordance with MIL-STD-454, Requirement 61.

3.3.2.7 Equipment cables and junction and distribution boxes. - All power cabling supplied or specified by the contractor shall be in accordance with the National Electrical Code. The equipment shall provide for connection to existing power and communication facilities using electrical components listed by Underwriter's Laboratory.

3.3.2.8 Solderless wrapped electrical connections. - Solderless wrapped electrical connections shall be used only for backplane wiring using appropriately designed wraposts (terminals). (See 3.5.30). Color coding is not required for wires used in backplane wiring.

3.3.2.9 Test points, test facilities, and test equipment. - Test points, test facilities, and test equipment (internal and external) shall be in accordance with MIL-STD-454, Requirement 32, with the following exclusions and additions:

- a. Paragraphs 5.2.2 to 5.2.3.3 (automatic checkout and automatic monitoring capabilities and Built-In-Test (BIT) capability) of MIL-STD-415 shall not apply, unless specifically required in the equipment specification.
- b. Test points and controls for adjustment shall not be located in compartments with voltage points of 300 volts or more. All test points and controls for adjustments shall be located so as to preclude accidental shock to personnel engaged in normal operating or maintenance activities.
- c. Test point data in accordance with MIL-STD-415, paragraphs 6.3.1 through 6.3.5 shall be submitted to the Contracting Officer as specified in the contract schedule (see 6.2).

3.3.3 Mechanical.

3.3.3.1 Furnishing of removable parts and mating connectors. - Each equipment furnished by the contractor shall be complete with an installed set of fuses, lamps, plug-in relays, plug-in crystals, ferrule-type resistors, and other parts which are used in the equipment and which are similarly designed for quick removal and replacement. Parts which may be damaged by shipment in the operating sockets shall be packed in the normal part shipping container along with information to identify the operating socket. Where a coaxial or cable connector is provided on a piece of equipment furnished under the contract which will be connected to another piece of equipment not being furnished under the contract, the contractor shall supply the mating connector for the equipment under contract. Also, when two or more pieces of equipment furnished under the contract require interconnection, the contractor shall supply the necessary mating connectors. Telephone-type plugs and jacks are excluded from this requirement except as specified in the equipment specification.

3.3.3.2 Hydraulics. - The design and installation of hydraulic systems shall be in accordance with MIL-STD-454, Requirement 49.

3.3.3.3 Installation. - The equipment shall be so designed that it can be easily installed, removed, and reinstalled with a minimum of special tools and without extensive dissassembly. In addition, the following also apply:

- a. Pull-out drawers. - All equipment pull-out drawers shall be of a full-suspension roller type with latching stops. Friction-slide construction is prohibited. Slides shall

be of sufficient rigidity to prevent bowing and having rollers jump their track.

- b. Rack panels. - Where rack panels are used, they shall be in accordance with ANSI/EIA Standard RS-310-C-77, except that only slot/hole arrangements which can be used for mounting in cabinets with wide-spacing mounting rail hole pattern shall be used. Panels as a minimum shall be 3/16 inch aluminum alloy or 1/8 inch steel. Ferrous materials shall be in accordance with MIL-STD-454, Requirement 15.

3.3.3.4 Construction. - The equipment shall be constructed so that no fixed part shall become loose, no movable part or permanently set adjustment shall shift its setting or position, and no degradation shall be caused in the performance specified in the equipment specification, under the following mechanical service conditions:

- a. Operating: Inclination at any angle up to 10 degrees from the normal position.
- b. Non-operating: Storage in any position for a period of two years.

3.3.3.5 Moisture pockets. - The control and drainage of moisture pockets in equipment shall be in accordance with MIL-STD-454, Requirement 31.

3.3.3.6 Windows. - Equipment windows, including dial windows, shall be shatterproof clear glass, or heat resistant plastic secured to the panels in bezels by means of clips or other devices to prevent displacement of the glass. Cement shall not be used to secure the glass. (See 3.5.15).

3.3.4 Environmental conditions and requirements.

3.3.4.1 Operation under the service conditions. - Except where otherwise specified herein, or in the equipment specification or the contract, all specification requirements for operation under the service conditions shall be met when the equipment is operated at the specified duty cycle, and under all fixed or slowly varying conditions of AC line voltage and frequency, and DC voltage, as applicable (see 3.3.2.5):

- a. within the ranges of these parameters specified for the service conditions;
- b. simultaneously with the combinations of service conditions, values of ambient temperature and ambient relative humidity using the procedures provided in 4.11; and

- c. simultaneously over the service conditions range of barometric pressure.

Under the same conditions, the specification requirement for voltages, currents, power dissipation and temperature, as applicable to specific parts and materials, shall not be exceeded in starting and operating the equipment.

3.3.4.2 Fixed adjustment provision. - The requirements of 3.3.4.1 apply after the equipment has been initially adjusted under normal test conditions following procedures to be included in the equipment instruction book; and unless otherwise specified in the equipment specification, without further adjustment during testing, including the entire cycle of test under 4.11 where applicable.

3.3.5 Reliability. - The contractor shall provide and maintain a reliability program in accordance with MIL-STD-454, Requirement 35, when specified in the equipment specification or the contract schedule. The contractor shall have one clearly identified organizational element which will be responsible for the planning and management of the contract reliability program and for ensuring its effective execution. The individual designated as the head of this reliability management organization shall have the necessary authority and resources to discharge this responsibility, and shall report at a level having full responsibility for the contract effort. Although the accomplishment of many of the reliability program tasks may not be the line function of the reliability management organization, that organization shall monitor and ensure that all reliability program tasks are accomplished effectively. Where the equipment specification delineates a reliability analysis, it shall be performed according to the techniques and data of MIL-HDBK-217. The attendant mean time between failure calculations, failure rates, and availability shall be performed for each equipment or item specified. A parts application review report and an identification of critical items as defined by MIL-STD-785 shall also be included. This data shall be furnished to the Government no later than 30 days prior to any preproduction or prototype assembly or design approval, whichever is the earlier, for review and approval. Unless specifically exempted, all electrical, electronic, electromechanical and mechanical parts shall be included in the analysis. Specific exempt items are parts such as structural members, braces, frames, and chassis racks, but not printed circuit boards, sockets, and solder joints.

3.3.6 Maintainability. - When specified in the equipment specification or the contract schedule, the contractor shall provide and maintain a maintainability program in accordance with MIL-STD-454, Requirement 54. A clearly identified organizational element shall be responsible for the planning, implementation, and management of the maintainability program. The individual designated as head of this maintainability organizational element shall have sufficient authority and responsibility to establish and

enforce maintainability policies and procedures. As a minimum, all maintainability analyses shall contain a maintainability prediction based upon maintainability parameter values generated in conformance with MIL-STD-470.

3.4 Parts and materials; general.

3.4.1 Application, use and orientation of parts and materials. - Application and use of parts and materials shall be in accordance with the respective applicable specifications and in accordance with requirements of this specification. However, if such specifications do not cover use and application for a given part or material, the manufacturer's recommendations shall be followed. When the equipment is in its normal operating position, parts shall be oriented in accordance with the equipment specifications or manufacturer's recommendations. In the absence of any data covering the intended application, use and orientation shall be consistent with valid engineering considerations, including operating and reliability requirements.

3.4.2 Certification of military specification parts and materials. - Parts and materials specified herein as required to meet requirements of military specifications shall be certified by the contractor in accordance with 4.5.

3.4.3 Specific parts. - In some instances a part may be specified in the equipment specification as a manufacturer's product, or equal, identified by catalog number or equivalent description, with or without additional provisions. When so designated, this constitutes the complete specification for the part, and the part shall not be redesigned, reworked, refinished, or modified in any manner except where a modifying requirement in the equipment specification identifies the specific part in stating the modifying requirement.

3.4.4 Military standard and military specification parts. - In many instances, military standard or military specification parts, or families of parts, are called out herein or in the equipment specification, with or without additional provisions. Such a call-out constitutes the complete specification for the part, and the part shall not be redesigned, reworked, refinished, or modified in any manner except where a modifying requirement in this specification or in the equipment specification makes specific reference both to the part and to the military document in stating a modifying requirement.

3.4.5 'Standard and 'Nonstandard' parts and materials. - Standard and nonstandard parts and materials require Government approval under procedures given in Appendix I, prior to adoption by the contractor for design and use in the equipment. The contractor shall not order or manufacture such parts or materials until said contractor has complied with Appendix I requirements and received

written approval from the Contracting Officer or designated Technical Officer for usage in the equipment.

3.4.6 Submission of requests for approval of Standard and nonstandard parts and materials. - All requests for approval of standard and nonstandard items shall be submitted by the contractor in accordance with Appendix I.

3.4.7 Contractor's responsibility. - Government approval of standard and nonstandard parts shall not relieve the contractor of his responsibility for meeting all related specification requirements.

3.4.8 Mounting of small parts. - Mounting of small parts shall be in accordance with MIL-STD-454, Requirement 5.

3.4.9 Derating policy and design tolerance values.

3.4.9.1 Electronic part derating policy. - Derating of parts shall be in accordance with MIL-STD-454, Requirement 18.

3.4.9.2 Design tolerance (end-of-life) values. - In designing circuitry for long term performance, consideration shall be given to part parameter drift. The circuits should be designed to perform their intended function accommodating this long term parameter drift.

3.4.10 Bonding, securing, and fastening methods. - Structural bonding and assembly of the equipment, including assembly of structures, panels, subpanels, chassis, subchassis, brackets, all mechanical and electrical parts, all subassemblies, also all mounting devices, guides and retainers for parts and for subassemblies, such as resistor boards, printed wiring boards and cards, shall be accomplished exclusively by means of processes, securing methods, fasteners, and other devices, that are specifically called out in this specification. Other types of bonding, securing, and fastening shall not be used.

3.4.11 Interchangeability. - Interchangeability shall be in accordance with MIL-STD-454, Requirement 7.

3.5 Parts.

3.5.1 Batteries. - Batteries shall not be used unless specifically required by the equipment specification, in which case the batteries shall be in accordance with MIL-STD-454, Requirement 27.

3.5.2 Bearings. - Bearings shall be in accordance with MIL-STD-454, Requirement 6.

3.5.3 Capacitors. - Capacitors shall be in accordance with MIL-STD-454, Requirement 2.

3.5.4 Circuit breakers. - Circuit breakers shall be in accordance with MIL-STD-454, Requirement 37 and shall be mounted on the front panel.

3.5.5 Controls. - Controls shall be in accordance with MIL-STD-454, Requirement 28 and shall comply with the human engineering criteria established in MIL-STD-454, Requirement 62. Normal settings of all continuously variable controls shall not fall in the first tenth or last tenth of angular rotation.

3.5.6 Crystal units, quartz. - Quartz crystal units shall be in accordance with MIL-STD-454, Requirement 38.

3.5.7 Delay lines. - Fixed electromagnetic pulse delay lines shall be in accordance with MIL-D-23859.

3.5.8 Electrical connectors. - Electrical connectors shall be in accordance with MIL-STD-454, Requirement 10. Where two or more connectors (other than coaxial types) are used on a given equipment unit, interchanging of the mating connectors shall be rendered impossible by differing contact arrangements, keying, or other positive means. The AC line receptacles and power cords shall be in accordance with paragraph 3.3.2.1.6.

3.5.9 Electron tubes. - Electron tubes shall not be used unless specifically permitted by the equipment specification, in which case the electron tubes shall be in accordance with MIL-STD-454, Requirement 29. (See 3.3.1.3).

3.5.10 Fastener hardware. - Fastener hardware shall be in accordance with MIL-STD-454, Requirement 12.

3.5.10.1 Rivets and eyelets. - Where rivets are used they shall be the solid type. Eyelets shall not be used for fastening devices.

3.5.11 Filters, electrical. - Electrical filters shall be in accordance with MIL-STD-454, Requirement 70, with the following additional requirements:

- a. MIL-F-18327 nonstandard cases and mountings designated "YY" and "ZZ" shall not be used, and the temperature class shall be limited to R, S, and V. The life expectancy shall be limited to X.
- b. The operating temperature range shall be limited to B and C of MIL-F-15733.

3.5.12 Fuses, fuseholders, and associated hardware. - Fuses, fuseholders, and associated hardware shall be in accordance with

MIL-STD-454, Requirement 39. Fuseholders shall be the extractor type and shall be mounted on the front panel and so located that they are readily replaceable and located in a convenient, serviceable location. Indicating type fuseholders are mandatory for fuses used in AC line circuits (120V to 240V nominal design values). (See 3.3.2.4.4).

3.5.13 Gaskets. - Gaskets for windows, access doors, and covers shall be of synthetic rubber conforming to MIL-G-1149. Gaskets shall be installed on both sides of windows and shall provide the same degree of enclosure as the housing to which they are secured. The gaskets for access doors and covers shall be cemented or otherwise fixed in place to prevent displacement when such doors or covers are opened or removed.

3.5.14 Gears and cams. - Gears and cams shall be in accordance with MIL-STD-454, Requirement 48, except that nonmetallic gears shall be limited to nylon and polytetrafluoroethylene.

3.5.15 Glass. - Unless otherwise specified, all glass used in the equipment shall be of the shatterproof type in accordance with Class 1, Type I, or Class 2 of Specification MIL-G-3787.

3.5.16 Grommets. - Grommets shall conform to the requirements of MIL-G-3036, MIL-G-16491, or MIL-G-22529.

3.5.17 Indicator lights. - Indicator light assemblies and lamps therefore shall be in accordance with MIL-STD-454, Requirement 50. Only flange base or bayonet base shall be used. Selection of colors for indicator light lens shall be in accordance with MIL-STD-1472 (see 3.3.1.6). Indicator lights shall not be connected in series.

3.5.18 Meters, electrical indicating. - Meters shall be 3-1/2 inch or 2-1/2 inch rectangular panel type electrical indicating instruments in accordance with ANSI Standard C.39.1, or in accordance with MIL-STD-454, Requirement 51, except that for other than time measurement, 1 inch meters shall not be used. The following also applies:

- a. Rectifier meters shall not be used to indicate powerline voltage or current, or filament/heater voltage or current.
- b. Where meters are physically located or electrically connected so that stray RF fields or currents developed within the equipment could cause damage to the meters or false indications, the meters shall be suitably protected therefrom.
- c. Clearance behind the panel shall be sufficient to accommodate replacement meters having the maximum depth behind panel allowed by ANSI Standard C.39.1 for the same basic size and type of meter.

3.5.18.1 Meter switching. - Where meter switching is employed, the requirements in the following subparagraphs shall apply.

- a. The power supply or other basic source of the electrical quantity being metered shall have an output voltage, at its highest potential point, which shall not exceed 500 volts peak relative to ground, under all circumstances of parts failure and load removal.
- b. Indications shall be in terms of actual voltages or currents after appropriate multiplying factors have been applied to the meter indications.
- c. Accuracy of indications at full-scale indication, after application of multiplying factors, shall be within $(M + 2)$ percent of the actual voltage or current, where M is the percent-of-full-scale accuracy (rated, not actual) of the meter movement on its basic range (multipliers and shunts of meter switching circuit not connected to the meter terminals).
- d. Meter switching shall be limited, in the case of current-indicating meters, to meter movements requiring 1 milliamperes or less for full-scale deflection.

3.5.19 Meter shunts and transformers. - Meter shunts and transformers shall be in accordance with MIL-STD-454, Requirement 40.

3.5.20 Microelectronic devices. - Microelectronic devices, shall be in accordance with MIL-STD-454, Requirement 64. Plastic encapsulation or sealed devices shall not be used. The following also applies:

- a. Sockets, when used for mounting, shall be in accordance with MIL-S-83734.
- b. For devices not covered by MIL-M-38510, the information specified in paragraph 4.1 of MIL-STD-454, Requirement 64 shall be submitted to the FAA for approval in accordance with paragraph 3.4.5 of FAA-G-2100.

3.5.21 Motors, dynamotors, rotary power converters and motor-generators. - Motors, dynamotors, rotary power converters and motor-generators shall be in accordance with MIL-STD-454, Requirement 46. Motors not capable of carrying locked-rotor current continuously when stalled, without permanent damage, shall be protected by use of fuses, circuit breakers, or manual reset thermal cutouts. Manual reset thermal cutouts shall be readily accessible for resetting. Multiphase motors shall be protected from damage which could occur as a result of loss of one phase of the power source.

3.5.22 O-rings. - O-ring gaskets used to seal interfaces shall be selected from sizes readily commercially available and shall meet the environmental requirements specified herein. O-rings shall be as specified in MS 9386, MS 9388, or MS 28900.

3.5.23 Printed wiring and printed wiring boards. - Printed wiring shall be in accordance with MIL-STD-454, Requirement 17. In addition, the following applies:

- a. Paper base copper-clad laminates are not permitted for printed wiring boards. (This is an exception to paragraph 3.4.1 of MIL-P-55110 and paragraph 5.6.1 of MIL-STD-275.)
- b. The maximum size of each printed circuit board shall not exceed 64 square inches with a length to width ratio not exceeding 3.25 to 1; the maximum number of pin connectors per printed circuit board shall be 128.
- c. Multi-layer boards shall not exceed 4 layers; power and ground shall be internal with all signal leads on the outside.

3.5.24 Readout devices. - Readout devices shall be in accordance with MIL-STD-454, Requirement 68.

3.5.25 Relays and contactors. - Relays and contactors shall be in accordance with MIL-STD-454, Requirement 57.

3.5.26 Resistors and thermistors. - Resistors and thermistors shall be in accordance with MIL-STD-454, Requirement 33.

3.5.27 Rotary servo devices. - Servomotors, synchros, resolvers, tachometer generators, encoders, and transolvers shall be in accordance with MIL-STD-454, Requirement 56.

3.5.28 Semiconductor devices. - Semiconductor devices shall be in accordance with MIL-STD-454, Requirement 30.

3.5.29 Sockets and accessories. - Sockets and accessories for plug-in parts shall be in accordance with MIL-STD-454, Requirement 60. Use of sockets for mounting integrated circuits shall be predicated on the FAA Program Maintenance Concept and shall require approval of the Government.

3.5.30 Solderless wrapped electrical connections. - Solderless wrapped electrical connections (see 3.3.2.8) shall be in accordance with MIL-STD-454, Requirement 69.

3.5.31 Special tools. - Special tools shall be in accordance with MIL-STD-454, Requirement 63.

3.5.32 Springs. - Springs shall be in accordance with MIL-STD-454, Requirement 41.

3.5.33 Switches. - Switches shall be in accordance with MIL-STD-454, Requirement 58. Interlock switches, when used, shall be in accordance with MIL-S-8805/56 (see 3.3.1.8.2).

3.5.34 Terminals (terminals, boards, and strips). - Terminals (terminals, boards, and strips) shall be in accordance with MIL-STD-454, Requirement 19, except that only one wire may terminate in an individual lug terminal (Modifies paragraph 4.1 of MIL-STD-454, Requirement 19). Terminal boards used in interconnecting units shall have 10 percent extra spare unused terminals, but in no case less than two.

3.5.35 Transformers, inductors, and coils. - Transformers, inductors, and coils shall be in accordance with MIL-STD-454, Requirement 14. All power transformers shall have an electrostatic shield.

3.5.36 Tuning dial mechanisms. - Tuning dial mechanisms shall be in accordance with MIL-STD-454, Requirement 42.

3.5.37 Waveguides and related equipment. - Waveguides and related equipment shall be in accordance with MIL-STD-454, Requirement 53.

3.5.38 Wiring. - Internal wiring practices shall be in accordance with MIL-STD-454, Requirement 69. Selection and application of cable and wire for interconnection between units shall be in accordance with MIL-STD-454, Requirement 71. All wire used in making circuit connections (other than RF) shall have a cross-section area to current ratio of not less than 500 circular mils per ampere.

- a. Electrical wire shall be in accordance with MIL-STD-454, Requirement 20.
- b. Coaxial radio frequency (RF) transmission cable shall be in accordance with MIL-STD-454, Requirement 65.
- c. Multiconductor cable shall be in accordance with MIL-STD-454, Requirement 66.

3.6 Materials. - Materials used in the construction of each equipment and the method of application shall be as specified in the equipment specification or as specified herein. Material used in parts specified herein shall be in accordance with applicable referenced specifications. Materials which are not specified herein require approval by the Contracting Officer or his designated Technical Officer. Non-flammable and non-toxic materials shall be used.

3.6.1 Adhesives. - Adhesives shall not be used without prior Government approval, in which case they shall be in accordance with MIL-STD-454, Requirement 23.

3.6.2 Arc-resistant materials. - Materials used for insulation of electrical power circuits, where arcing is possible (connector inserts, relays, circuit breakers, etc.), shall be in accordance with MIL-STD-454, Requirement 26.

3.6.3 Dissimilar metals. - Selection and protection of dissimilar metal combinations shall be in accordance with MIL-STD-454, Requirement 16.

3.6.4 Ferrous alloys. - Selection and application of ferrous alloys shall be in accordance with MIL-STD-454, Requirement 15.

3.6.5 Fibrous material, organic. - Fibrous material shall not be used without prior approval, in which case it shall be in accordance with MIL-STD-454, Requirement 44.

3.6.6 Flammable materials. - Flammable materials shall not be used without prior approval. Test for flammability shall be in accordance with MIL-STD-454, Requirement 3.

3.6.7 Fungus-inert materials. - Fungus-inert materials shall be in accordance with MIL-STD-454, Requirement 4.

3.6.8 Insulating materials, electrical. - Insulators, insulating, and dielectric materials shall be in accordance with MIL-STD-454, Requirement 11.

3.6.9 Lubricants. Lubricants shall be in accordance with MIL-STD-454, Requirement 43.

3.6.10 Rubber (natural). - Natural rubber shall not be used.

3.6.11 Wood and wood products. - Wood and wood products shall not be used.

3.7 Processes.

3.7.1 Brazing. - Brazing shall be in accordance with MIL-STD-454, Requirement 59, except that electrical connections shall not be brazed except as permitted by the grounding requirements of paragraph 3.3.1.5.

3.7.2 Castings. - Castings shall be in accordance with MIL-STD-454, Requirement 21.

3.7.3 Encapsulation and embedment (potting). - Encapsulation and embedment (potting) material and applications shall be in accordance with MIL-STD-454, Requirement 47.

3.7.4 Soldering. - Soldering shall be in accordance with MIL-STD-454, Requirement 5.

3.7.5 Welding. - Structural welding shall be in accordance with MIL-STD-454, Requirement 13.

3.7.6 Welds; resistance welds of electrical and electronic interconnections. - Electrical interconnection resistance welds shall be in accordance with MIL-STD-454, Requirement 24.

3.7.7 Finishes. - Surfaces shall be given a protective finish as specified in the following subparagraphs.

3.7.7.1 Painted surfaces. - Painted surfaces shall be in accordance with FAA-STD-012.

- a. Front surfaces of exterior metallic surfaces. - For equipment installed in buildings or shelters the front face and edges of exterior front panels and panel doors, and the exterior surfaces of equipment cabinets, portable cabinets, and all other final metallic enclosures, including the doors thereof and exterior trim strips, shall be finished by applying one or more uniform spray coats of a baking primer, mixed, applied, and baked on in accordance with FAA-STD-012; such baking shall be followed by application of one or more uniform spray coats of a hard lusterless alkyd baking enamel having a smooth matte texture mixed, applied, and baked on in accordance with FAA-STD-012 and TT-E-527, with exception of the units of gloss. The units of gloss of the matte finish, when measured shall be between 10 and 17 units using Federal Test Method Standard No. 141, Method No. 6103 (85-Degree Specular Gloss) as the basis for compliance. The color of the final coat shall be brown, matching Color No. 30372 of Federal Standard No. 595. The contractor shall furnish certification that metal test panels, finished along with the equipment as specified above, have been tested for water resistance and hydrocarbon resistance, using the test procedures given in Federal Specification TT-E-527 for these two characteristics; and have been tested in accordance with Method No. 6103 of FED-STD-141 and have successfully met the gloss requirements specified herein.
- b. Back surfaces of exterior metallic surfaces. - Exterior front panels and panel doors finished as specified in (a) above shall have their back surfaces finished in one of the following ways: same as front surface; or with a baked primer (only) which is the same color as the front surface but not necessarily closely matched thereto; or as specified in (c) below for interior aluminum surfaces. Masking or equivalent means shall be employed where necessary to insure continuity of electrical contact with

metallic mounting surfaces, chassis, parts, etc., assembled against the back surface of the panel or panel door.

- c. Interior aluminum surfaces. - The chassis, interior panels, and other interior surfaces of aluminum and aluminum alloy (except castings) shall be thoroughly cleaned by an alkaline dip or equivalent process so as to produce an etched surface (etching not mandatory where treatment (1), chemical film is employed). After etching, an additional treatment which will protect the surface from finger-marks shall be applied, using one of the processes listed in subparagraphs below. The process specified in (1) below shall be regulated so that the electrical conductivity of the surface is adequate to insure low-resistance contact of fasteners and other metal parts which are assembled to the surface, without the necessity of masking or other processing.

(1) Chemical film treatment equivalent to Class 3 specified in MIL-C-5541.

(2) Clear anodizing. Masking or other means to insure low-resistance contact shall be employed.

- d. Other interior metal surfaces. - All interior metal surfaces of the equipment structure (other than stainless steel and monel) not covered under the above paragraphs shall be protected by a durable coating of light gray enamel, or by a protective electroplating. Interior aluminum and aluminum alloy castings may be finished as specified in (c) above, or this paragraph, or may be left unfinished.

3.7.7.2 Plated finishes. - Where electroplating is employed as a finish, it shall be equal to the best commercial grade, using plating thicknesses adequate for protection of the parts under conditions of their use in service. Flash platings, platings with base metals or underplatings showing through, or platings which are pitted or give evidence of flaking or peeling, are not acceptable. The type of platings which shall be used on specified base metals are as follows:

Base Metal

Monel

Stainless steel

Plating Requirements

None; smooth finish free from discoloration.

Passivation treatment after machining; smooth

	finish free from discoloration.
Ferrous metal	Exterior hardware - bright chromium over nickel and copper Interior hardware - zinc, or white chromium over nickel and copper, or white or bright cadmium.
Copper, Brasses, Bronzes	Exterior hardware - bright nickel or chromium. Interior hardware - white or bright nickel or chromium. Other parts - white or bright nickel, chromium, tin or cadmium.

- a. Cadmium plating. - Cadmium plating shall not be used if it is in direct contact with, or located in confined spaces adjacent to waxes, phenolics, or other organic materials which will react with the cadmium to cause "growth" or the formation of cadmium soaps.
- b. RF conductivity platings. - Where required because of considerations of conductivity, silver, gold, or rhodium electroplating may used. If silver plating is used, the plating process shall be such as to insure a minimum thickness of 0.0005 inch. In addition, and except as noted below, the silver plating shall be given a clear chromate conversion coating which will meet the requirements of QQ-S-365 for solderability, and the requirements for tarnish resistance under Grade A (supplementary tarnish resistant chromate treatment). The chromate conversion coating shall be omitted on silver-plated surfaces where contact requirements are such that an increase of 15 percent in surface contact resistance cannot be tolerated.

3.8 Reference designations. - Reference designations shall be assigned (and marked) in accordance with ANSI 200-75, except as modified as follows:

- a. Paragraph 4.1.5.5, third paragraph, line 5; delete "may" and substitute "shall".
- b. Delete text of paragraph 4.1.8 and substitute "If a part serves a function other than the function for which it is designed, or a dual function, it shall nevertheless be represented on the schematic diagram by the graphic symbol and reference designation (latter chosen from Section 22

of ANSI 315-75) indicative of the physical characteristics of the part. Where space permits, the special function shall be noted on the diagram; in any case, it shall be described in the instruction book for the equipment.

- c. Delete subparagraph (3) under paragraph 8.1.
- d. Delete Section 10.

3.9 Marking. - Marking shall be as specified in the paragraphs below, and as provided for in 3.8. In addition, all markings shall be permanent and legible.

3.9.1 Visibility of parts labels. - All parts which have labels or markings carrying identifying data or ratings should be mounted so that the data are visible to maintenance personnel without the necessity for disassembly of the part or of adjacent functional or structural parts. This requirement shall be mandatory whenever it can be applied by the contractor without purchasing made-to-order parts with special markings, and where it can be applied without preventing the use of normally compact assemblies of parts on chassis, such as side-by-side mounting of metal-cased capacitors, or other normal methods of assembly.

3.9.2 Other parts markings. - Additional markings for certain parts are required, as specified in subparagraphs below.

- a. Electron tubes and crystal units. - Reference designations shall not be marked on electron tubes or crystal units. The type number and reference designation of each tube or crystal unit shall be marked adjacent to the tube or crystal-unit socket, on the plug-in side of the chassis. The reference designation for the socket shall be marked on the reverse side of the chassis adjacent to the socket. When space is not available for marking the required tube and crystal unit reference designations and type numbers, a suitable label showing location of the tubes and crystal units and the corresponding reference designations shall be mounted inside the chassis, where it will be readily visible when viewing the tubes and crystal units in place.
- b. RF connectors. - All RF connectors furnished on the equipment for the purpose of making external connections shall be clearly identified on the plug-in side by word labels descriptive of their specific functions (e.g., ANT, IF INPUT, RF OUTPUT, etc.).
- c. Ferrule-resistor positions. - All ferrule-resistor positions shall be marked to indicate the ohmic value of the resistor required for the particular position or mounting.

- d. Other ferrule-mounting parts. - Where other parts with ferrule ends such as semiconductor rectifiers and vacuum capacitors are mounted in fuse clips, polarity markings shall be provided where applicable.
- e. Fuse positions. - All fuse positions shall be marked with the rated current capacity of the fuse to be employed therein. Fuse positions for delayed-action fuses shall have the additional designation SLOW. The markings shall be on the insertion side, so as to be visible when replacing fuses.
- f. Terminal strips and blocks. - The terminals of all terminal strips and blocks, including those which are used for movable links or other adjustable circuit jumpers, shall be identified by numerals or other designations located immediately adjacent to the respective terminals, and marked directly on the terminal strip or block or immediately adjacent thereto.
- g. Wafer switches. - Markings or other means of identification shall be provided on the equipment to enable a technician to identify the physical locations of wafer switch contacts for circuit tracing purposes.
- h. Markings, controls and indicating devices. - Markings shall be provided on the fronts of each exterior and interior panel and panel door, also on control-mounting surfaces of each chassis, sub-panel, etc. to clearly (though necessarily briefly) designate the functions and operations of all controls, fuses, and indicating devices mounted thereon, protruding through, or available through access holes therein. All markings shall be located on the panel or chassis in correct relationship to the respective designated items.
- i. Polarized parts. - Where mounting arrangements for polarized parts are such it would be possible for a replacement part to be mounted with terminal positions misplaced on reversed (as in the case of polarized capacitors, semiconductors diodes or transistors, microelectronics, relays, connectors, transformers) polarity markings shall be provided on the mounting structure of the equipment, located and oriented so that the symbols can be clearly associated with the physical location of the connection points. Devices in the listing below shall have the specific markings indicated:
 - (1) Semiconductor diodes: The schematic graphical symbol (as used on instruction book diagrams).

- (2) Transistors and other semiconductor devices having three or more leads: The schematic graphical symbol wherever marking space permits, otherwise identifying letters (such as E B C for transistors).
- (3) Polarized capacitors and other devices with + and - terminal markings: + -.
- j. Other electrical parts. - On subminiaturized assemblies, transistors, integrated circuits, printed boards or other form of assembly where space is at a premium, the reference designation need not be marked. In lieu thereof, reference designation marking shall be shown by means of pictorial diagram, line drawings, photographs or other media to provide for circuit identification (by means of reference designations) appropriate for the equipment.
- k. Nonelectrical parts. - The reference designation for each nonelectrical part, except screws, nuts, washers, bushings, pipe fittings and similar small hardware, shall be marked on the chassis, frame, panel, etc., immediately adjacent to the part; but if space is not available, the reference designation shall be marked on the part itself.

3.9.3 Panel markings. - The visible surface adjacent to panel facilities such as connectors, controls, indicators, jacks, keys, switches and fuse holders shall be marked with a suitable word, phrase, or abbreviation, indicating the use or purpose of the part. These markings shall be legible so that the function of the panel facility can be identified by the operator. Continuously variable operating controls shall be provided with markings that permit the operator to set the control to a predetermined point. Markings on the fronts of panels and panel doors (other than equipment nameplates, 3.10) shall be made in accordance with one of the following subparagraphs.

3.9.3.1 Individual designation plates. - Designation plates shall be in accordance with MIL-P-15024.

3.9.3.2 Markings on the panel surface. - One of the following processes shall be used:

- a. Engraving through the paint and then filled with contrasting color enamel.
- b. Markings by epoxy ink process.

3.9.4 Interior marking methods. - Markings on the interiors and rear surfaces of equipment shall be made by one of the following methods, using white markings on dark surfaces and black markings on light surfaces to provide maximum readability:

- a. Engraving through paint, or on unpainted surfaces; contrasting color engraving wax or enamel shall be used as a filler except where contract without filler provides adequate readability.
- b. Silk screen process.
- c. Stenciling
- d. Individual designation plates in accordance with MIL-P-15024.

3.9.5 Stamping required on equipment. - The contractor shall mark the following on each piece of equipment having an FAA nameplate using a rubber stamp or equivalent means of marking:

Warranty: Yes _____ No _____

DATE ACCEPTED _____

DATE INSTALLED _____

IF WARRANTY APPLIES SEE INSTRUCTION BOOK

3.9.5.1 Stamping of actual dates. - The FAA Quality and Reliability Officer (QRO) will stamp in the actual date the equipment is accepted, using a rubber date-stamp. If no FAA QRO is assigned, the contractor shall stamp in the date on which the equipment successfully passes the final tests as shown in the certified test data. The remaining two dates shall not be inserted.

3.9.5.2 Location of stamping. - The stamping shall be located on the back side of the front panel door, unless required space is not available, in which case the stamping shall be located on the rear vertical surface of the chassis. In case space is not available in either location, or where construction differs from that described above, the contractor shall obtain Government approval of the proposed location before stamping the equipment.

3.10 Nameplates. - Each equipment furnished shall have one or more nameplates as determined by the equipment configuration. Each nameplate shall be in accordance with FAA Drawing B-21216. (See Figure 1 following Section 6.)

3.10.1 Equipment titles. - Unless specifically set forth in the equipment specification, the contractor shall request titles and type designations before preparing and submitting the nameplate drawings to the Contracting Officer. The specification titles shall not be assumed to be the correct equipment titles for use on the nameplates.

3.10.2 Serial numbers. - Serial numbers shall start with 1 for each equipment unit having an individual nameplate and continue consecutively up to the total number of such equipment units on the contract.

3.11 Workmanship. - Workmanship shall be in accordance with MIL-STD-454, Requirement 9.

4. QUALITY ASSURANCE PROVISIONS

4.1 Quality control provisions. - The contractor shall provide and maintain a quality control program in accordance with FAA-STD-013, FAA-STD-016, or other program, as specified in the equipment specification or contract schedule. All tests and inspection made by the contractor shall be subject to Government inspection (see 3.2.7).

4.2 Contractor's detailed list of tests. - The contractor shall prepare a list of the tests he proposes to conduct as a means of proving compliance with the performance requirements of the equipment specification. This list shall identify all detailed tests to be performed and shall be submitted to the Government for formal review and approval. All test procedures shall reference the specific specification paragraph number being demonstrated. In addition to the tests proposed by the contractor, his list shall include the tests of 4.3 unless they are specifically excluded in the equipment specification or contract schedule. This list shall be broken down into design qualification tests (4.3.2), type tests (4.3.3), and production tests (4.3.4), with appropriate use of steps 1 to 9 of Table VIII under 4.11 hereof, also line voltage variations, to prove compliance under 3.3.4.1 hereof (also see 4.8 through 4.10 hereof). Where applicable the FCC Type Acceptance and Registration Procedures tests (4.3.5) and the reliability-maintainability demonstration tests (4.3.6) shall be included in the list of tests.

4.2.1 Submission of test documentation. - Submission for approval of the test list, test procedures, and test data shall be as specified in FAA-STD-013, FAA-STD-016, or the contract schedule.

4.3 Classification of tests. - Five classes of tests are required, as follows:

- a. Contractor's Preliminary Tests (4.3.1)
- b. Design Qualification Tests (4.3.2)
- c. Type Tests (4.3.3)
- d. Production Tests (4.3.4)
- e. FCC Type Acceptance and Registration Procedures (4.3.5)

When specified, reliability and/or maintainability demonstration tests (4.3.6) shall be conducted by the contractor in accordance with the approved Reliability/Maintainability Program Plan which

details how the contractor proposes to meet the reliability/maintainability requirements.

4.3.1 Contractor's preliminary tests. - Prior to the time the contractor notifies the Government that the initial production equipment is ready for inspection, and to demonstrate readiness for inspection, he shall make one complete set of all tests required by the equipment specification and this general specification. These preliminary tests shall be made on one production equipment or on one prototype (preproduction) model. The contractor's preliminary tests do not constitute any of the regular design qualification tests, type tests, reliability-maintainability tests, or production tests (nor FCC Type Acceptance and Registration Procedures tests where applicable under 3.3.1.4) required by the equipment specification or by this general specification.

4.3.1.1 Preliminary test data. - The contractor shall submit to the Government Contracting Officer a certified copy of the test data covering all the contractor's preliminary tests. This test data may be submitted along with the proposed test procedures and forms under FAA-STD-013, FAA-STD-016, or the contract schedule, but in any case the test data shall be submitted not less than 15 work days in advance of the date set for inspection pursuant to 4.3.1.2.

4.3.1.2 Notification of readiness for inspection. - After submission of the preliminary test data, and when the contractor has one or more production equipments completed, i.e., equipments produced to meet all specification requirements, he shall notify the Government Contracting Officer in writing that he is ready for Government inspection. Such notification shall be given in time to reach the Contracting Officer not less than five work days before the contractor desires inspection to start.

4.3.2 Design qualification tests. - The following tests (and verification) shall be made once, prior to, or concurrent with the first type test, on regular production equipment selected by the Government Representative.

- a. Rating verification, parts and materials (4.3.2.1)
- b. Other general specification tests (4.3.2.2)
- c. Design qualification tests specified in the equipment specification

4.3.2.1 Rating verification, parts and materials. - Measurements, or calculations, or both, shall be made in order to establish that the parts (see 3.5) and insulating materials (see 3.6) used in the equipment will not be subjected to voltages, currents, power dissipation, and temperature, in excess of the derated values permitted by applicable specification requirements and 3.4.9 of this specification. All power supplies over 600 volts which are potted or encapsulated shall be subjected to a 48 hour heat run with all critical internal components instrumented to insure that proper

temperature derating has been incorporated in the design. The instrumented heat run shall be performed with the power supply operating in the equipment in its final configuration location. Upon request by the FAA, the contractor shall make available, at the inspection location specified in the contract, any rating verification, parts and material data requested to review adequacy of measurements or calculations.

4.3.2.2 Other general specification tests. - Tests shall be made once, prior to, or concurrent with the first type test on regular production equipment to establish that the requirements of Table V, wherever applicable, are being met.

TABLE V

GENERAL SPECIFICATION TESTS

Specification Requirement	Paragraph No.
Transient Protection	3.3.1.5
Noise levels	3.3.1.7
Interlock bypass switch	3.3.1.8.2
voltage limitations	
(at maximum line voltage	
in service conditions	
range)	
X-radiation	3.3.1.8.3
Ground potentials	3.3.1.8.4
Positive static pressure	3.3.1.9.2
Exhaust air temperature	3.3.1.9.3
AC line controls	3.3.2.1.1
AC line inputs resistance	3.3.2.1.3
to ground (service	
conditions of temperature	
and humidity)	
Transformer isolation, DC	3.3.2.1.7
power supplies	
Electrical load balance	3.3.2.4.1
(when applicable)	
Power factor	
Equipment effect on power	3.3.2.4.2
source (when applicable)	
Overload protection (at minimum	3.3.2.4.4
line voltage in service	
conditions range)	
Equipment response versus	3.3.2.5
condition of primary	
input power	
Electromagnetic interference	3.3.2.6

control	
Meter switching: Peak voltage	3.5.18.1(a)
Accuracy	3.4.18.1(c)
Motor protection, locked rotor	3.5.21

4.3.3 Type tests. - Unless otherwise defined or modified in the equipment or system specification, type tests are tests performed to verify that the equipment or system performs over the range of specified service conditions (see paragraph 3.2.15). These tests shall be performed on regular production equipment or systems in accordance with paragraphs 3.3.4.1, 3.3.4.2, 4.3.3.1, and 4.11.

4.3.3.1 Type test equipment selection. - The equipment selection for type testing shall be in accordance with the contract schedule, the equipment specification, or both. In the absence of specific requirements in the contract schedule or the equipment specification, the following applies:

- a. The equipments on the contract shall be assigned sequential numbers in order of reaching the stage of completion and readiness for testing. Using these sequential numbers, the equipment shall be divided into groups for type testing as shown in Table VI below. One type test shall be performed for each type test group. (The essential characteristic of any type test group must be homogeneity.) With the exception of Type Test No. 1, selection of an equipment for type test within the group shall be made by the FAA representative.
- b. When the type test is successfully completed, the equipment in the group from which the type test equipment was taken is released for final inspection and shipment; the equipments in the next succeeding type test group are released for inspection and production testing only. If it is the last type test group, successful completion of the type test releases all remaining equipment for final inspection and shipment.
- c. If a type test is not successfully completed and requires parts or design changes or both in order to meet the specified type test parameters:
 - (1) These parts or design changes or both shall be incorporated in the group from which the type test equipment was taken, and all equipments retested to the extent determined necessary by the Government, prior to final inspection, acceptance or delivery.
 - (2) The contractor shall propose a plan, acceptable to the Government, for the correction/modification of previously accepted and delivered equipments in accordance with applicable contract warranty

provisions and the requirement of 3.3 herein. Where field modification is appropriate (whether by contractor or Government personnel) the contractor shall provide the necessary parts, instructions, and instruction manual revisions in accordance with FAA Order 1320.33B "Equipment Modification and Facility Instruction Directives."

TABLE VI
TYPE TEST EQUIPMENT SELECTION

Type-Test Groups								
Contract Quantity	I	II	III	IV	V	VI	VII	VIII
1-10	1							
11-25	1	2-10						
26-50	1	2-10	11-35					
51-75	1	2-10	11-35	36-60				
76-100	1	2-10	11-35	36-75				
101-150	1	2-10	11-50	51-100				
151-200	1	2-10	11-50	51-100	101-150			
201-300	1	2-10	11-50	51-100	101-150	151-200		
301-500	1	2-10	11-50	51-100	101-200	201-300	301-400	
501-700	1	2-10	11-50	51-100	101-200	201-300	301-400	401-600
701 and up as specified in the procurement document								

4.3.4 Production tests. - Production tests shall be made as specified in the Government approved list of tests (see 4.2) on each production equipment, including those subjected to type tests. Production tests shall be performed under normal test conditions (see 3.2.11).

4.3.5 FCC Type Acceptance and Registration procedures. - Where applicable under 3.3.1.4, the first production equipment shall be subjected to the FCC Type Acceptance and Registration Procedures in accordance with FCC Rules and Regulations: Part 2, Subpart J, Part 87, and Part 68. The environmental temperature range specified by the FCC shall supersede, for the purposes of the FCC Type Acceptance Procedures, the service conditions temperature range which is applicable under the equipment specification and this specification. In addition, during the life of the contract, the contractor shall comply with FCC regulations in connection with any

approved changes made to the production equipments which are relevant to the FCC Type Acceptance or Registration.

4.3.5.1 FAA acceptance contingent on FCC Type Acceptance. -The contractor shall furnish the Government Contracting Officer a copy of the FCC 'Notice to applicant of type acceptance' letter or postcard, or, if type acceptance is granted by FCC without such written notice, the contractor's certification to that effect, dated and signed by a responsible contractor official as a condition for acceptance of the equipment by the Government under the contract.

4.3.5.2 FAA acceptance contingent upon FCC Type Registration. - The contractor shall furnish the Government Contracting Officer a copy of the FCC Form 484 titled "Registration under Part 68," or if registration is granted by FCC without such documentation, the contractor's certification to that effect, dated and signed by a responsible contractor official as a condition for acceptance of the equipment by the Government under the contract.

4.3.6 Reliability and/or maintainability demonstration tests. - Where required by the contract, life tests and formal reliability and/or maintainability demonstration tests shall be conducted by the contractor as specifically described in the Reliability/Maintainability Program plan. Reliability and/or maintainability demonstration tests shall be made on regular production equipment, including those subjected to Type and Production Tests. The contractor shall notify the Government Contracting Officer in writing that he is ready for Government inspection. Such notification shall be given in time to reach the Contracting Officer not less than five working days before the contractor desires inspection to start.

4.3.6.1 Preventive maintenance. - Preventive maintenance shall be allowed only to the extent as specified in the equipment specification. Preventive maintenance is defined as the scheduled replacement of shortlife items and the scheduled and allowed peaking or tuning that is required to maintain performance within specification limits. It does not include board, module or part replacement predicated on characteristic changes which might lead to failures. These would be classified as corrective maintenance actions.

4.4 Test equipment.

4.4.1 Furnishing of test equipment. - The contractor shall supply all test equipment necessary for the tests required. The contractor shall provide and maintain all measuring and test equipment in accordance with FAA-STD-013, FAA-STD-016, or the contract schedule, including on-site testing if installation is a requirement of the contract.

4.4.2 Basic instrument accuracy. - Instruments for measurement of certain basic electrical quantities shall have the rated accuracies specified in Table VII, or better (instrument manufacturer's rating or testing laboratory certification). The percentages given in Table VII for indicating instruments are percentages of full scale. All readings shall be made within the upper 50 percent of the scale arc.

TABLE VII
BASIC INSTRUMENT ACCURACY

Electrical Quantity	Instrument Accuracy
Resistance	See 4.4.3
DC voltage, current, power	± 0.5 percent
AC voltage, current, power at 60 Hz (except filament/heater voltage)	± 1.0 percent
Filament/heater voltage	± 0.5 percent
Frequency, AC line (60 Hz)	± 0.5 percent

4.4.2.1 Allowance for less-accurate instruments. - As an exception to the requirement for rated accuracies in accordance with Table VII, the contractor may use instruments which are less accurate, up to a limit of twice the percentage values shown in the table, but only for the measurement of an electrical quantity for which a tolerance is specified, and provided that the additional instrument tolerance shall be subtracted from the tolerance specified for the electrical quantity. For example, a contractor uses a 1 percent AC voltmeter for measurement of filament voltage where filament voltage tolerance is ± 3 percent; required instrument accuracy from table is ± 0.5 percent. The additional 0.5 percent instrument tolerance is subtracted from 3 percent giving 2.5 percent as the required filament voltage tolerance when using the 1 percent instrument.

4.4.3 Resistance measuring equipment. - For measurement of resistors having a rated accuracy of ± 2 percent or better (also to measure resistors of lesser accuracy to resolve questions where tolerances are apparently exceeded by a small margin), and for measurement of transformer and other part's windings for determination of temperature rise by the rise-in-resistance method, a Wheatstone bridge having components equal to or better than the following shall be used:

Rated accuracy of ratio resistors:	± 0.05 percent
Rated accuracy of arm resistors:	± 0.1 percent

Rated sensitivity of galvanometer:

1 uA per
millimeter

Digital multimeters having ohmeter accuracy of $\pm 0.1\%$ or better may be used.

4.4.4 Temperature indicators. - Temperature indicating equipment shall have an accuracy $\pm 2^{\circ}\text{C}$ or better.

4.4.5 Humidity measurement accuracy. - The techniques used to measure relative humidity shall provide readings within five percentage points of true relative humidity.

4.4.6 Instrument accuracy for other measurements. - Instruments for the measurement of quantities other than those specified in 4.4.2 to 4.4.3 shall have actual calibrated accuracies greater by a factor of three (as a minimum) with reference to the tolerance specified for each quantity.

4.5 Certification of JAN/MIL type parts and materials. - The Federal Aviation Administration does not normally make source inspection of JAN/MIL type parts and materials used in electronic equipment being manufactured under FAA contracts. In order to provide the Government with evidence that parts and materials meet the requirements of applicable military specifications, it will be necessary for prime contractors to comply with 4.5.1 and 4.5.2. After receipt of the parts and materials at the contractor's plant, the FAA QRO may carry out visual and other inspection, and in cases of doubt, request certified test data (4.5.2).

4.5.1 Subcontract, purchase order, and invoice submission. - The contractor shall provide the FAA QRO, upon request, a copy of his applicable purchase orders for Government verification purposes. The contractor shall submit, upon request, to the FAA QRO, copies of invoices covering shipments of items from the suppliers facilities to that of the prime contractor. Each invoice shall contain the vendor's certification that each item furnished meets the requirements of the applicable specification(s). This certification must be traceable to the part or material manufacturer's quantitative test data pertaining to the specific part or material.

4.5.2 Certified test data. - When requested by the FAA QRO (4.5), the contractor shall furnish certified test data verifying compliance with applicable specifications.

4.6 Availability of applicable documents. - The contractor shall make available for reference use by the FAA QRO a complete set of the applicable documents - specifications, publications, drawings, except those issued by FAA - for the equipment being furnished on the contract.

4.7 Inspection of design and production status. - Upon request from the Government, the contractor shall make available for review at his plant, at any stage of the contract, all information regarding the design and production status of the equipment being manufactured under the contract. Such information shall be available at the plant regardless of point of manufacture of the individual components. The contractor shall provide, for retention by the Government, two copies of each schematic and logic diagram on all electronic assemblies. The schematics shall be those in effect at the time the request is made and all subsequent revisions shall be provided, if requested by the Government.

4.8 AC line frequency. - Testing shall be done at an AC line frequency of 60HZ (+0.5Hz); the contractor shall demonstrate by means of design calculations and parts specifications the ability of the equipment to meet performance requirements at all line frequencies (other than 60 Hz) specified under the service conditions; or, in lieu of the foregoing, the contractor has the option of testing at all specified AC line frequencies.

4.9 Barometric pressure. - At the option of the contractor, testing shall be done either at the barometric pressure corresponding to the maximum altitude specified under the service conditions, or at the barometric pressure prevailing at the test site; in the latter case, the contractor shall demonstrate by means of design calculations and parts specifications the ability of the equipment to meet performance requirements at the maximum altitude specified under the service conditions.

4.10 Wind and ice loading. - Where wind and ice loading are specified under the service conditions, the contractor has the option of demonstrating compliance by any of the following means: dynamic testing; static load testing using loads which produce stresses equivalent to the specified dynamic loads; or calculations of structural strength versus dynamic stresses based on design parameters and parts and materials specifications.

4.11 Environmental test procedures (Service conditions). - Unless otherwise specified in the equipment specification, design qualification tests and type tests shall be conducted under service conditions (see 3.3.4.1), without equipment adjustment (see 3.3.4.2), and shall be conducted with the equipment in a thermally-insulated chamber. Uniform ambient temperature throughout the chamber shall be obtained. Means of slowly circulating the air in the chamber may be provided, but violent agitation of the air resulting in rapid circulation through and around the equipment will not be permitted. The chamber shall be equipped with recording devices that will read on detachable material a continuous record of both temperature and humidity. When making the required tests, line voltage variation (3.3.4.1) shall be included. Tests shall be performed in accordance with the approved tests procedures and shall be in accordance with the procedure shown in Table VIII.

TABLE VIIIENVIRONMENTAL TEST PROCEDURE (SERVICE CONDITIONS)

STEP	PROCEDURE
1	Place equipment in chamber under normal test conditions. Make all required tests and record all readings. No further adjustments to controls of equipment under test shall be made during Steps 2 through 8.
2	Turn equipment off. Reduce temperature to minimum specified for service conditions (or lower) at any relative humidity.
3	After a minimum of two hours, but not before equipment under test has stabilized at minimum temperature, or lower, as determined by sensors located in the equipment, turn equipment on. After 15 minutes begin tests. Finish all tests as rapidly as possible and record readings.
4	With equipment in operation, increase temperature to maximum specified for service conditions in 5 hours or less at any relative humidity. Maintain maximum temperature, or higher, for not less than 6 hours. During this process, record all readings approximately each 10°C rise in temperature, but not less than once an hour during the temperature-increasing period. During stabilization period, record all readings once an hour (or more frequently) with a final reading at end of the period.
5	Turn equipment off. Adjust relative humidity to high humidity range or value as applicable under service conditions, holding temperature to maximum specified, or higher. Maintain chamber at these values of ambient temperature and relative humidity for not less than 24 hours.
6	Turn equipment on and begin tests in 15 minutes. Finish all tests as rapidly as possible and record all readings.
7	Turn equipment off and return chamber to any temperature within normal test conditions temperature range at any relative humidity. Equipment may now be removed from chamber, if specified normal test conditions of ambient temperature exist outside of chamber.
8	After 2 hours or more, turn equipment on and allow to operate for not less than 48 hours under normal test conditions. Record all readings at beginning and end of 48-hour period.

- 9 After the complete cycle of tests the equipment shall be examined for indications of rust, corrosion, flaking of plating, deterioration of paint, and deformation of plastic materials, to determine specification compliance.

5. PREPARATION FOR DELIVERY

5.1 General. - Requirements for packaging, packing and marking for shipment shall be as specified in the equipment specification or work statement and will be in accordance with MIL-E-17555.

6. NOTES

6.1 Note on information items. - The contents of this section 6 are only for the information of the initiator of the procurement request, and are not a part of the requirements of this specification. They are not contract requirements, nor binding on either the Government or the contractor. In order for these terms to become a part of a resulting contract, they must be specifically incorporated in the equipment specification or the contract schedule. Any reliance placed by the contractor on the information in these subparagraphs is wholly at the contractor's own risk.

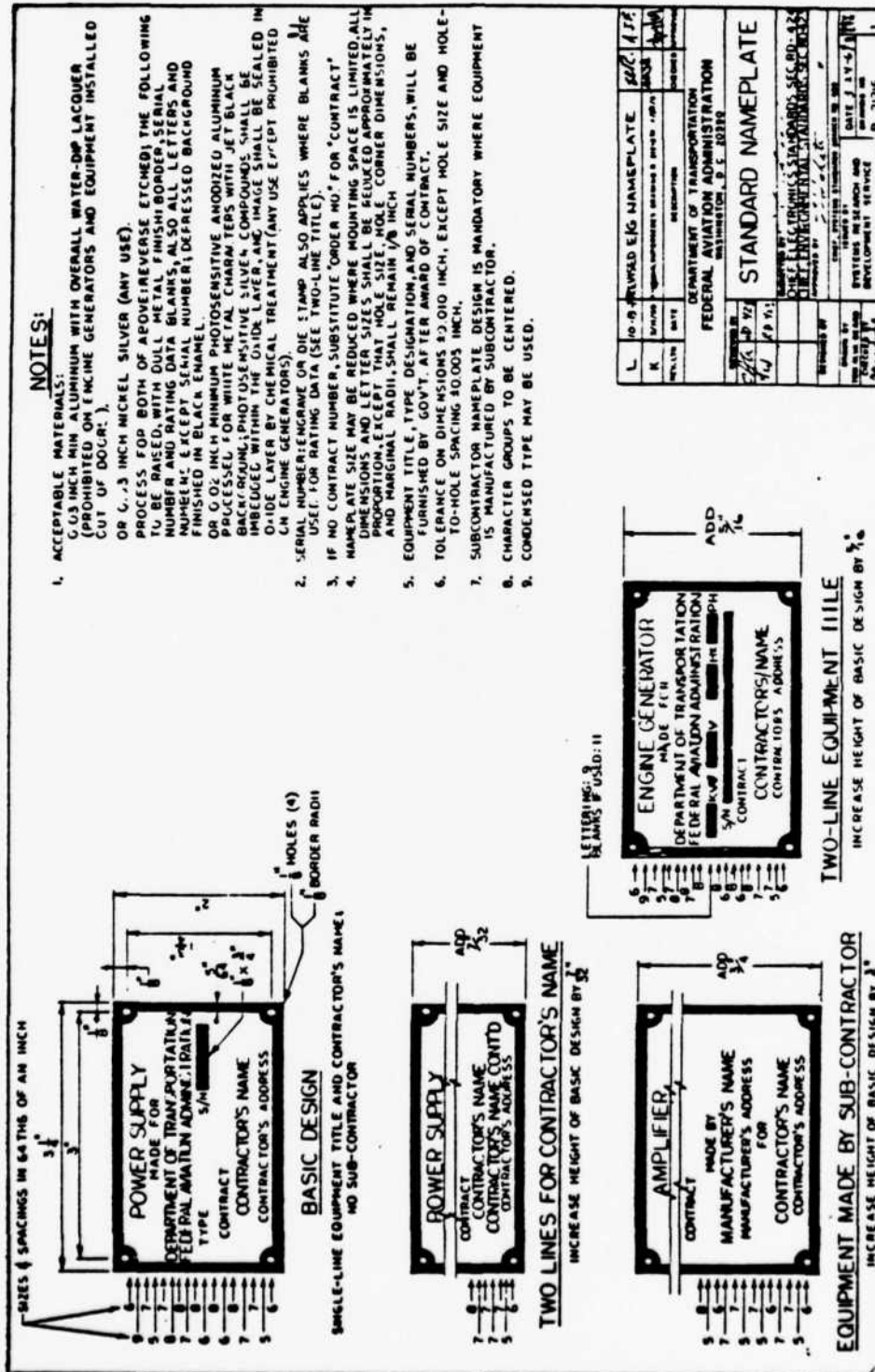
6.2 Additional data required. - Attention of procurement request initiators is invited to the items listed below which should be covered in the equipment specification or contract schedule.

- a. Environmental conditions in which the equipment will be required to operate (see 3.2.15).
- b. If design requirements are other than as specified in this specification, the equipment specification should clearly state the allowable deviations (see 3.3).
- c. Applicability of FAA-STD-020 (see 3.3.1.5).
- d. Quantitative human engineering requirements (see 3.3.1.6).
- e. Requirements for convenience outlets (see 3.3.2.1.4).
- f. Requirements for detachable power cord and AC line receptacle (see 3.3.2.1.6).
- g. EMI control requirements (see 3.3.2.6).
- h. Requirements for test point data (see 3.3.2.9).
- i. Requirements for mating cable connectors (see 3.3.3.1).

- j. Requirements if aluminum front panels are mandatory (3.3.3.3.b).
- k. Reliability requirements and reliability program plan (see 3.3.5).
- l. Maintainability requirements and maintainability program plan (see 3.3.6).
- m. Requirements for meters; indicate if elapsed time indicators are required; if so what type (see 3.5.18).
- n. Requirements for number and location of nameplates (see 3.10).
- o. Requirement for detailed list of performance tests (see 4.2).
 - (1) Requirement for Contractor's Preliminary Tests (4.3.1).
 - (2) Requirements for Design Qualification Tests (4.3.2).
 - (3) Requirements for Type Tests (see 4.3.3 and 4.11).
 - (4) Requirements for Production Tests (see 4.3.4).
 - (5) Requirements for Reliability Demonstration Tests (see 4.3.6).
- p. Levels of preservation, packaging, and packing if other than specified herein (5.1).

6.3 Type testing, quantities over 700. - For contract quantities over 700, the contract schedule should specify the type test requirements under 4.3.3.1.

6.4 Provisioning. - When providing for provisioning, the terms "Part-common" and "Part-peculiar" should be used as defined in FAA-G-1375, Spare Parts-Peculiar for Electronic, Electrical and Mechanical Equipment. The terms "standard parts and materials" and "nonstandard parts and materials" are as defined in paragraphs 3.2.13b and 3.2.13c of this specification.



INDEX

SUBJECT	PARAGRAPH
AC	3.3.2.1
Controls	3.3.2.1.1
Convenience Outlets	3.3.2.1.4
Input Resistance to Ground	3.3.2.1.3
Line Controls to be Provided	3.3.2.1.5
Line Receptacles	3.3.2.1.6
Main Power Switches	3.3.2.1.2
Power Cord	3.3.2.1.6
Transformer Isolation	3.3.2.1.7
Accessibility	3.3.1.1
Acoustic Levels	3.3.1.7
Adhesives	3.6.1
Air Filter	3.3.1.9.1
Air-Flow Interlock	3.3.1.9
Air-Flow Velocity Through Filters	3.3.1.9.1
Air Temperature, Exhaust	3.3.1.9.3
Applicable Documents	2
Arc - Resistant Materials	3.6.2
Backplane Wiring	3.3.2.8
Barometric Pressure	3.3.4.1
Batteries	3.5.1
Bearings	3.5.2
Bonding, Electrical	3.3.1.5
Bonding Methods (structural)	3.4.10
Brazing	3.7.1
Bypass Switch	3.3.1.8.2
Cabinet or Console Pressure	3.3.1.9.2
Cable	3.5.38
Cadmium Plating	3.7.7.2
Cams	3.5.14
Capacitors	3.5.3
Castings	3.7.2
Circuit Breakers	3.5.4
Circuit Protection	3.3.2.2
Coaxial RF Cable	3.5.38
Coils	3.5.35
Color (Lens)	3.5.17
Communications and Data Exchange	3.3.2.3
Connectors, Electrical	3.5.8
Connectors, Printed Circuit	3.5.23
Contactors	3.5.25
Controls	3.5.5
Controls, AC	3.3.2.1.1

Convenience Outlets	3.3.2.1.4
Converters, Rotary Power	3.5.21
Cooling	3.3.1.9
Corona Prevention	3.3.1.2
Crystal Units, Quartz	3.5.6
DC Power Supply Isolation	3.3.2.1.7
Definitions	3.2
Delay Lines	3.5.7
Derating Policy	3.4.9
Design, Equipment	3.3
Design Values	3.2.10
Designation Plates	3.9.3.1
Detachable Power Cord	3.3.2.1.6
Deviations From Design Requirements	3.3
Dial Windows	3.3.3.6
Dielectric Materials	3.6.8
Diodes, Markings	3.9.2
Dissimilar Metals	3.6.3
Distribution Boxes	3.3.2.7
Drawers, Pullout	3.3.3.3a
Dynamotors	3.5.21
Elapsed Time Indicators	3.5.18
Electrical Breakdown Prevention	3.3.1.2
Electrical Code	3.3.2
Electrical Filter	3.5.11
Electrical Load Balance	3.3.2.4.1
Electrical Overload Protection	3.3.2.4.4
Electrical Power Source	3.3.2.4
Electrical Wire	3.5.38
Electromagnetic Interference Control	3.3.2.6
Electron Tubes	3.3.1.3
Encapsulation and Embedment	3.7.3
Encoders	3.5.27
Environmental Conditions	3.3.4
Equipment Cables	3.5.38
Equipment Design	3.3
Equipment Effect on Power Source	3.3.2.4.3
Equipment Response to Input Power	3.3.2.5
Conditions	
Equipment Specification	3.2.6
Equipment Titles	3.10.1
Exhaust Air Temperature	3.3.1.9.3
Eyelets	3.5.10.1
Fastener Hardware	3.5.10
Fastening Methods	3.4.10
FCC Type Acceptance and Registration	3.3.1.4
Ferrous Alloys	3.6.4
Fibrous Material, Organic	3.6.5
Filters, Air	3.3.1.9.1

Filters, Electrical	3.5.11
Finishes	3.7.7
Fixed Adjustment Provision	3.3.4.2
Flammable Materials	3.6.6
Fungus - Inert Materials	3.6.7
Fuses, Fuseholders and Associated Hardware	3.5.12
Gaskets	3.5.13
Gears	3.5.14
General Requirements	3.1
Glass	3.5.15
Government Inspection	3.2.7
Grommets	3.5.16
Grounding of Metal Cases	3.3.1.8.4
Grounding Requirements	3.3.1.5
Hardware, Fastener	3.5.10
Harmonic Distortion	3.2.17
Human Engineering	3.3.1.6
Hydraulics	3.3.3.2
Ice Loading	3.2.15
Indicator Light Assemblies and Lamps	3.5.17
Inductors	3.5.35
Input Power Conditions, Equipment Response to	3.3.2.5
Installation of Equipment	3.3.3.3
Insulating Materials, Electrical	3.6.8
Integrated Circuits	3.5.20
Interchangeability	3.4.11
Interlock, Air-Flow	3.3.1.9
Interlock Switch, Bypass	3.3.1.8.2
Isolation, DC Power Supply	3.3.2.1.7
Junction Boxes	3.3.2.7
Lamps	3.5.17
Line Receptacle	3.3.2.1.6
Lubricants	3.6.9
Maintainability	3.3.6
Marking	3.9
Marking, Interior	3.9.4
Materials	3.6
Mechanical Construction, Equipment	3.3.3.4
Meters, Electrical Indicating	3.5.18
Meters, High Voltages	3.3.1.8.1
Meter Shunts and Transformers	3.5.19
Meter Switching	3.5.18.1
Microelectronic Devices	3.5.20
Moisture Pockets	3.3.3.5

Motors and Motor Generators	3.5.21
Motors, D.C.	3.3.1.9
Motor Protection	3.5.21
Multiconductor Cable	3.5.38
Multi-Layer Boards	3.5.23
Nameplates	3.10
Noise Level Limits	3.3.1.7
Normal Test Conditions	3.2.11
Notes	6
O-Rings	3.5.22
Operation Under Service Conditions	3.3.4.1
Overload Protection, Electrical	3.3.2.4.4
Painted Surfaces, Exterior and Interior	3.7.7.1
Panel Markings	3.9.3
Panel Mounted AC Line Controls	3.3.2.1.5
Panels, Rack	3.3.3.3b
Parts and Materials, General	3.4
Application and Orientation	3.4.1
Certification of MIL Spec Items	3.4.2
Derating Policy	3.4.9.1
Design Tolerance (End of Life)	3.4.9.2
Policy	
Furnishing of Removable Parts and	3.3.3.1
Mating Connectors	
Labeling	3.9.1
Marking	3.9.2
Military Standard & Specification	3.4.4
Mounting of Small Parts	3.4.8
Standard and Nonstandard	3.4.5
Approval	3.4.5
Contractors Responsibility	3.4.7
Data Requirements	3.4.5
Definition	3.2.13
Submission for approval	3.4.6
Proprietary	3.4.3
Requirements	3.4.5
Standard (Definition)	3.2.13
Passivation	3.7.7.2
Personnel Safety	3.3.1.8
Plated Finishes	3.7.7.2
Plating, Cadmium & RF Conductivity	3.7.7.2
Potting	3.7.3
Power Cabling	3.3.2.7
Power Factor	3.3.2.4.2
Power Supplies	4.3.2.1
Power Source, Electrical	3.3.2.4
Power Source, Equipment Effect on	3.3.2.4.3
Preparation for Delivery	5
Pressure, Cabinet or Console	3.3.1.9.2

Printed Circuit Connectors	3.5.23
Printed Wiring and Printed Wiring Boards	3.5.23
Processes	3.7
Protection, Motor	3.5.21
Prototype (Definition)	3.2.5
Pullout Drawers	3.3.3.3a
Quality Assurance Provisions	4
Applicable Documents, Availability	4.6
Barometric Pressure	4.9
Certification (Parts & Materials)	4.5
Certified Test Data	4.5.2
Design Qualification Tests	4.3.2
Environmental Test Procedures (Service Conditions)	4.11
FCC Type Acceptance Procedures	4.3.5
General Specification Tests	4.3.2.2
Humidity Measurement Accuracy	4.4.5
Inspection Status	4.7
Instrument Accuracy, Basic	4.4.2
Instrument Accuracy, Other Measurements	4.4.6
Invoice Submission	4.5.1
Less Accurate Instruments	4.4.2.1
Line Frequency	4.8
List of Tests, Contractors	4.2
Maintainability Demonstration Tests	4.3.6
Preliminary Tests	4.3.1
Preliminary Test Data	4.3.1.1
Production Tests	4.3.4
Rating Verification, Parts and Materials	4.3.2.1
Reliability Demonstration Tests	4.3.6
Resistance Measurement Equipment	4.4.3
Temperature Indicators	4.4.4
Test Classification	4.3
Test Equipment	4.4
Type Tests	4.3.3
Type Test Equipment Selection	4.3.3.1
Wind and Ice Loading	4.10
Rack Panels	3.3.3.3b
Readout Devices	3.5.24
Reference Designations	3.8
Relative Humidity	3.3.4.1
Relays	3.5.25
Reliability	3.3.5
Resistance Welds of Electrical Interconnections	3.7.6
Resistors	3.5.26
Resolvers	3.5.27

RF Cable	3.5.38
RF Conductivity Platings	3.7.7.2
Rivets	3.5.10.1
Rotary Power Converters	3.5.21
Rotary Servo Devices	3.5.27
Rubber	3.6.10
Safety, Personnel	3.3.1.8
Securing Methods	3.4.10
Semiconductor Devices	3.5.28
Serial Numbers, Equipment	3.10.2
Service Conditions	3.3.4.1
Servomotors	3.5.27
Shielding	3.3.1.5
Sockets	3.5.29
Soldering	3.7.4
Solderless Wrapped Connections	3.5.30
Special Tools	3.5.31
Springs	3.5.32
Stamping Required on Equipment	3.9.5
Static Air Pressure	3.3.1.9.2
Steady-State Power Condition	3.3.2.5
Structural Welding	3.7.5
Switches	3.5.33
Synchros	3.5.27
Tachometer Generators	3.5.27
Terminals, Boards and Strips	3.5.34
Test Conditions, Normal	3.2.11
Test Points, Test Facilities and Test Equipment	3.3.2.9
Thermal Design	3.3.1.9
Thermistors	3.5.26
Three-Phase Electrical Power	3.3.2.4.1
Tolerances	3.2.16
Transformers	3.5.35
Transient Protection	3.3.1.5
Transolvers	3.5.27
Tubes, Electron	3.3.1.3
Tuning Dial Mechanisms	3.5.36
Ventilation	3.3.1.9.2
Waveguides and Related Equipment	3.5.37
Welding	3.7.5
Welds, Resistance, Electrical Inter- connections	3.7.6
Windows	3.3.3.6
Wire	3.5.38
Electrical Wire	3.5.38
Multiconductor Cable	3.5.38

RF Coaxial Cable	3.5.38
Wiring, Backplane	3.3.2.8
Wiring Practices, Internal	3.5.38
Wind Loading	3.3.4
Wood and Wood Products	3.6.11
Workmanship	3.11
Wraposts (Terminals)	3.3.2.8
Wrapped Connections, Solderless	3.5.30
X-Ray Protection	3.3.1.8.3

APPENDIX I

REQUEST FOR APPROVAL, PARTS AND MATERIELS

1. Data Requirement:

The contractor shall prepare a Program Parts Selection List (PPSL) for all parts listed in MIL-STD-965, paragraph 6.4. The number of different part types shall be held to a minimum and the use of standard parts shall be maximized. The PPSL shall be printed only after the proposed parts have been submitted and approved by the FAA in accordance with this Appendix.

2. General:

- a. Standard parts proposed for listing in the PPSL shall be submitted for approval on DD Form 2053 (Fig. 1).
- b. Nonstandard parts approval requests shall be submitted by preparing Part I of a DD Form 2052 (Fig. 2).
- c. Parts contained in off-the-shelf equipment shall not be subjected to this procedure nor listed in the PPSL. When off-the-shelf equipment requires modification, the parts to be used in the modification are subject to this procedure.
- d. The contractor shall include contractual coverage in all their subcontracts and subcontractors in all their sub-subcontracts to insure compliance with this Appendix to the same extent as the prime contractor.
- e. The Military Parts Control Advisory Groups (MPCAGs) located at the Defense Electronics Supply Center (DESC) and the Defense Industrial Supply Center (DISC) are authorized to review and recommend disposition of parts requests submitted by contractors and act as advisor to the respective FAA procuring office in part selection and use. (MPCAGs will provide their recommendations to FAA within 14 days after receipt from the contractor).
- f. The respective FAA Washington DC procuring activity shall be the cognizant office over all RFA's and is the FAA focal point for the Parts Control Program in the equipment specification and applicable contract.

- g. The FAA's contracting officer or his designated technical representative shall be responsible for final approval and/or disposition of parts requests submitted by its contractors and for all formal contact with contractors.
- h. Standard parts meet the requirements of applicable military specifications. Nonstandard parts must be of like quality. To preclude marginal quality items in FAA equipment, nonstandard parts must be subjected to incoming inspection tests.

3. Requirements of Part Approval Forms (PAR)

- a. The PAR Forms to be used by contractors/subcontractors/sub-subcontractors are shown in Figure 3a and b. These PAR forms are to be completed by the contractors/subcontractors/sub-subcontractors with two duplicate copies submitted to the FAA Technical Officer and one original copy to the appropriate (See Para. 3.e.) MPCAG. Sub-subcontractors shall submit their PAR forms through their subcontractors; subcontractors shall submit their PAR forms through their contractors. The contractor shall include contractual coverage in all of their subcontracts to insure that the subcontractors/sub-subcontractors comply with this specification to the same extent as the prime contractor.
- b. The contractors/subcontractors/sub-subcontractors have the responsibility to fully determine and describe the characteristics of nonstandard requirements.
- c. The PAR forms shall be completed in full. The information thereon shall be typed or printed legibly to permit the reproduction of additional copies by normal methods.
- d. The contractor shall prepare three separate submissions: one covering electrical and electronic parts as shown in paragraph 6.4b of MIL-STD-965 (also FSC 3439 - Solder and Fluxes; FSC 6135 - Batteries and FSC 9330 - Plastics) which is to be distributed to DESC and the FAA, excluding DISC. The second submission covering mechanical parts as shown in paragraph 6.4a of MIL-STD-965 is to be distributed to DISC and the FAA, excluding DESC. The remaining items will be submitted to the FAA, excluding DESC and DISC.
- e. Requests for information and the submittal of part approval requests for MPCAG review will be sent to DESC or DISC as follows:

Commander
Defense Industrial Supply Center
ATTN: DISC-ESM
Philadelphia, PA 19111
Telephone number for general inquiries:
Area Code 215-697-3000 or 697-3007

4. Preparation of the PPSL and Part Approval Request (PAR)

- a. Each FAA contract will be assigned a five-digit contract code by the DESC MPCAG. Contractors must call the DESC MPCAG to obtain this code prior to the submission of any PARs. The log number of each PAR is the contract code followed by the appropriate Federal Supply Class (FSC) and a sequentially assigned four-digit number by the contractor.

Example: Log No. Contract - FSC - Index No. 5905 - 0005

- b. Proposed PPSL. Forty five days after contract award, a proposed PPSL shall be prepared on DD Form 2053, Program Parts Selection List Worksheet and submitted IAW paragraph 3d of this Appendix. Reproduction of the attached DD Form 2053 is authorized. The form may be handwritten or typed. (Fig. 3a). Instructions for completing the DD Form 2053 are provided on the reverse side of the form.
- c. Approved PPSL. The PPSL shall be prepared in accordance with Figure 2 of MIL-STD-965. The list shall be divided into two sections: Section I, General application parts; and Section II, Limited application parts. Each section shall be divided into two subsections: Subsection A, Mechanical parts; and Subsection B, Electrical and Electronic parts. Within each subsection the parts shall be listed within their Federal Stock Class. The list shall include the following, as a minimum for all standard and nonstandard parts approved by FAA.

- (1) Index number (see instructions on reverse side of DD Form 2053).
 - (2) Description. Includes part name (in accordance with Federal Cataloging Handbook, H6) and name modifiers. Related description data such as characteristics, sizes, part type or style, hardness assurance capability, and special material requirements may be included in the description.
 - (3) Procurement document number (Federal specification, military specification, industry specification, contractor specification or drawing).
 - (4) Part number (include actual part manufacturer's part number in addition to a control drawing part number).
 - (5) Federal Supply Code for Manufacturers (FSCM) in accordance with Federal Handbook H4 for each part number. Use 81349 for military specifications, 96906 for military standards, 81348 for Federal specifications, 06542 for Federal standards, 80205 for National Aerospace Standards, and 81352 for Air Force-Navy Aeronautical (AN standards) documents.
 - (6) Remarks: Includes pertinent comments on the part listed, (i.e., cross-reference between Section I and Section II, as applicable; qualification (QPL) status of part; restrictions placed on the usage of parts, including special screening requirements, limited application or other special provisions applied by the procuring activity or prime contractor; part documentation status, long lead time, technical risks and other remarks as appropriate).
- d. Revision. The PPSL shall be revised by page amendment, or by reissuance of the PPSL in accordance with 4.4.2 of MIL-STD-965.
- e. Proposed Addition to an Approved PPSL.
- (1) Standard parts. Proposed additions of standard parts shall be prepared on DD Form 2053, Program Parts Selection List Worksheet.
 - (2) Nonstandard parts. Proposed additions of nonstandard parts to the PPSL shall be prepared on DD Form 2052.
- f. Preparation of the NPAR Form (DD 2052, Figure 2).
- (1) All items in Part I on the NPAR form must be completed. Those items that may not be applicable

shall contain the letters "NA" (not applicable) or "none."

- (2) Complete preparation instructions are on the reverse side of the DD Form 2052. When completing Block 14 of the form, compare the nonstandard part to the standard part whose characteristics are nearest to those required for the application. Include:
- (a) If size and weight are the reasons for selection of the nonstandard part, give detailed advantages over the standard part.
 - (b) If electrical or mechanical characteristics are the reason for selection of the nonstandard part, give detailed performance degradation from use of the standard part measured in terms of overall equipment performance.
 - (c) If reliability is the reason for selection of a nonstandard part, provide supporting data.
 - (d) If undue delay in production is the reason for selection of a nonstandard part, give delivery dates and sources of both the standard part and nonstandard part.
 - (e) Supplemental data such as existing control drawings specifications, vendor data sheets, and other pertinent data. Data need not be furnished for nonstandard parts covered by documents listed in the Department of Defense Index of Specifications and Standards (DoDISS).
 - (f) In cases where the nonstandard is a process instead of part, similar detailed information shall be supplied. Step-by-step process flow charts shall be submitted, in addition to specific process specifications which apply to the process steps that will be changed to nonstandard.
 - (g) Failure rate data (to be completed by parts reliability engineer). This data shall include as a minimum, the failure rate per nonstandard item, the failure rate per standard item, number of items, estimated total failure rate impact and failure rate source. Failure rate sources must be identified as to MIL-HDBK-217c, GIDEP, Vendor, or subcontractor data based on test or field experience. In those cases where the information on failure rate and life cycle is not available at the time of submittal, it shall be

added by revision. All signatures appearing in the signature block shall be black ink to facilitate reproduction.

- g. The sub-subcontractor shall fill in, sign, date, and send the NPAR with all attachments to the subcontractor.

The subcontractor shall complete, sign, and forward the NPAR with all attachments to the contractor.

The contractor shall complete, sign, and forward the NPAR with all attachments to the FAA Technical Officer and when applicable to the appropriate MPCAG.

5. Military Parts Control Advisory Group. An Interagency Parts Control Agreement between the Department of Transportation/Federal Aviation Administration and the Defense Logistics Agency has been implemented. This agreement provides for a working arrangement and procedures that enables the Defense Logistic Agency (DLA) to act as advisor to FAA and their contractors in parts selection and use.

PROGRAM PARTS SELECTION LIST (PPM) WORKSHEET									
EQUIPMENT DESIGNATION									
CONTRACTOR:									
PART PROCUREMENT DOCUMENT NUMBER									
PART NUMBER									
QUANTITY									
DATE									
CONTRACT CODE									
DESCRIPTION CODE									
FAC									
VENDOR PART NUMBER									
FAC									
VENDOR PART NUMBER									
FAC									
ALTERNATE OR SUPPLEMENTAL DESCRIPTION									
INPUT 1									
INPUT 2									
INPUT 3									
INPUT 4									
INPUT 5									
INPUT 6									
INPUT 7									
INPUT 8									
INPUT 9									
INPUT 10									
INPUT 11									
INPUT 12									
INPUT 13									
INPUT 14									
INPUT 15									
INPUT 16									
INPUT 17									
INPUT 18									
INPUT 19									
INPUT 20									
INPUT 21									
INPUT 22									
INPUT 23									
INPUT 24									
INPUT 25									
INPUT 26									
INPUT 27									
INPUT 28									
INPUT 29									
INPUT 30									
INPUT 31									
INPUT 32									
INPUT 33									
INPUT 34									
INPUT 35									
INPUT 36									
INPUT 37									
INPUT 38									
INPUT 39									
INPUT 40									
INPUT 41									
INPUT 42									
INPUT 43									
INPUT 44									
INPUT 45									
INPUT 46									
INPUT 47									
INPUT 48									
INPUT 49									
INPUT 50									
INPUT 51									
INPUT 52									
INPUT 53									
INPUT 54									
INPUT 55									
INPUT 56									
INPUT 57									
INPUT 58									
INPUT 59									
INPUT 60									
INPUT 61									
INPUT 62									
INPUT 63									
INPUT 64									
INPUT 65									
INPUT 66									
INPUT 67									
INPUT 68									
INPUT 69									
INPUT 70									
INPUT 71									
INPUT 72									
INPUT 73									
INPUT 74									
INPUT 75									
INPUT 76									
INPUT 77									
INPUT 78									
INPUT 79									
INPUT 80									
INPUT 81									
INPUT 82									
INPUT 83									
INPUT 84									
INPUT 85									
INPUT 86									
INPUT 87									
INPUT 88									
INPUT 89									
INPUT 90									
INPUT 91									
INPUT 92									
INPUT 93									
INPUT 94									
INPUT 95									
INPUT 96									
INPUT 97									
INPUT 98									
INPUT 99									
INPUT 100									

FIGURE 1b

INSTRUCTIONS FOR COMPLETING DD FORM 2053, "PROGRAM PARTS SELECTION LIST"

1. Enter the contract number, equipment system, subsystem, contractor, date, contractor representative name and phone number in the appropriate space provided.
2. Up to six proposed PPSL parts can be listed on each form. There are three lines for each part and are numbered in card column (cc) 80 as 1, 2 and 3. The entry in cc 1-19 of line 1 of each card applies to each of the three lines. For simplicity, cc 1-19 is not shown on lines 2 and 3.
3. Enter 22A as cc 1-3 on the Document Identifier Code (DIC). Leave cc 4 blank.
4. Enter the five-digit contract code in cc 5-9. Call the Defense Electronics Supply Center, ACS13-794-5445 to obtain the code.
5. Assign a discrete index number to each part and to record six characters (cc 10-15). The index number for each PPSL part includes:
 - a. An alpha prefix to identify prime and subcontractors for extended parts only in cc 10. Leave the prefix (cc 10) blank when listing standard parts.
 - b. A minimum of four digits (cc 11-14) unique to each PPSL part. Left zero fill to cc 11-14. Example: 0001
 - c. An alpha suffix (cc 15) to identify relevant specific part listing index number on later transactions. Leave blank for initial part submissions.
6. Enter the PSC (cc 16-19) for the part.
7. The PSC in cc 16-19 and a name code in cc 20-29 form a description code. Upon request, each Military Parts Control Advisory Group (MPCAG) will furnish a list of Descriptive Codes based on standard part descriptions. (The PSC must be entered in cc 16-19). The name code may be entered in cc 20-29 at line 1 in place of a part description in line 3 (cc 20-29). When the name code is not entered in cc 20-29 of line 1, an alternate part description must be entered in cc 20-29 of line 3. Supplemental descriptive information in the standard part description (name code) may be entered in cc 20-29 of line 3.
8. Enter the part procurement document number, if applicable, in cc 30-49 of line 1. Leave blank when not applicable.
9. Enter the part number in cc 50-69 of line 1.
 - a. When the procurement document is entered in cc 30-49, the entry in cc 50-69 shall be the drawing or specification part number for the part. (In addition to the drawing or specification part number in cc 50-69, enter the actual part manufacturer's part number in line 3).
 - b. When a procurement document number is not entered in cc 30-49, enter the actual part manufacturer's part number in cc 50-69. If there is more than one source for the part, enter additional part numbers in line 2.
10. Enter the PSCM (Federal Supply Code for Manufacturers) associated with the document number (cc 30-49) and document part number (cc 50-69) in cc 70-74 of line 1.
 - a. Note: Use PSCM 81349 for military specifications and part numbers, 94704 for military sheet standards, 81348 for Federal specifications, 66543 for Federal standards, 81352 for Air Force - Navy Aeronautical (AM) standards, documents, and 66205 for National Aerospace Standards.
 - b. When a document number is not entered in cc 30-49, the entry in cc 70-74 shall be the PSCM of the actual part manufacturer's part number entered in cc 50-69.
11. Enter the quantity of parts estimated to be used for each equipment in cc 75-78 of line 1. Left zero fill (i.e., 0000).
12. Enter in cc 79 of line 1 an alpha letter to indicate the type of evaluation requested. Enter "D" for procurement document evaluation only, or "B" for both evaluations.
13. Enter "1" in cc 80 of line 1.
14. Entries in line 2 are to identify actual part manufacturer's part number (when not entered in line 1) and/or additional source (vendors) for the part. Two part numbers with their associated PSCMs may be entered in line 2 (cc 20-44 and cc 45-69), cc 70-79 of line 2 is left blank. If additional line 2's for the same index number are needed, use the line 2 intended for the next part input, leaving line 1 blank. The MPCAG computer program can accommodate up to three line 2's. Enter "2" in cc 80 of line 2.
15. Line 3 shall be used for alternate or supplemental descriptive information in cc 20-29. See restrictions in 7. If more card columns are needed use cc 20-29 of the next input (line 1) and re-number of line 4. The process can be attended by re-numbering the next line 2 as line 5, and the next line 3 as line 6. The maximum description is limited to lines 3 through 6 for a total of 240 card column characters.
16. In case both multiple line 2's and extended description information (line 3 through 6) are entered for the same part, use the input lines originally intended for the next index number. Re-number the line 2's as appropriate (i.e., 4, 5 and 6). If acceptance is required, call the appropriate MPCAG.

DD FORM 2053
APR 77

GPO : 1977 O - 584-888

FIGURE 2a

NONSTANDARD PART APPROVAL REQUEST				LOG NUMBER																			
NOTE: See instructions for preparation on reverse side																							
PART I - CONTRACTOR INPUT																							
1. PRIME CONTRACT NUMBER								2. CONTRACTOR															
3. EQUIPMENT SYSTEM SUBSYSTEM												3A. DATE OF INVITATION FOR BIDS (MFP REF)											
4. MILITARY PROCUREMENT DOCUMENT NUMBER (if applicable)								5. PART NUMBER				6. FSCW		7. QUANTITY									
4. VENDOR								5. VENDOR PART NUMBER				6. FSCW											
11. EVALUATION REQUESTED ("X" appropriate box) PART AND DOCUMENT <input type="checkbox"/> DOCUMENT ONLY <input type="checkbox"/>								11A. LOG NO. FOR PART PREVIOUSLY SUBMITTED ON THIS CONTRACT															
12. DESCRIPTION CODE				13. ALTERNATE OR SUPPLEMENTAL DESCRIPTION																			
14. REASON FOR USE OF NONSTANDARD PART (Compare part with nearest equivalent standard) (Continue on reverse side, if necessary)																							
15. NEWLY NEEDED BY		15. PRINTED OR TYPED NAME OF CONTRACTOR REPRESENTATIVE						DATE		PHONE NO. (Include Area Code)													
PART II - RECOMMENDATION																							
DATE IN		DUE DATE		EVAL. OPI		MPCAG MANAGER				SERVICE ACTY		ENGINEERING ITEM CODE											
15. APPROVAL				16. DISAPPROVAL				17. NO RECOMMENDATION				18. DOCUMENT EVALUATION											
WITHOUT LIMITATION				REPLACE WITH MIL PART (Complete also 19A thru D)				INSUFFICIENT INFORMATION (See comments, block 23)				ADEQUATE											
LIMITED OR LIGATION (Complete also 19A-E or 20A-C)				SPEC. DFGS PREPARED (Complete also 19A thru E)				NOT UNDER THIS REVIEW AGENCY				IN ADEQUATE (See comments block 23)											
OTHER LIMITATIONS (See comments block 23)				COMMERCIAL REPLACEMENT (Complete also 20A thru C)								NO DOCUMENT											
19A. REPLACE WITH (Enter Mil. Spec., Fed. Spec. or Gov't approved Std.)								20A. REPLACE WITH COMMERCIAL PART/TYPER STYLE NO.															
19B. MIL PART/TYPER STYLE NO.				19C. FSCW		20B. MANUFACTURER				20C. FSCW													
19D. OPL AVAILABLE <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A				19E. DATE MIL SPEC AVAILABLE				21. REPLACEMENT DESCRIPTION CODE (As applicable in also 19B or 20A)															
22. PART RECOMMENDED IN BLOCK 19B OR 20A IS <input type="checkbox"/> INTERCHANGEABLE <input type="checkbox"/> SUBSTITUTE <input type="checkbox"/> REPLACEMENT																							
23. COMMENTS (Continue on reverse side, if necessary)																							
EVALUATOR AND DATE												OPL MONITOR AND DATE											
<table border="1"> <tr> <td colspan="2">AOP INPUT</td> </tr> <tr> <td>A</td> <td></td> </tr> <tr> <td>B</td> <td></td> </tr> <tr> <td>P</td> <td></td> </tr> </table>																AOP INPUT		A		B		P	
AOP INPUT																							
A																							
B																							
P																							
PART III - PROCURING ACTIVITY DECISION ("X" only one box)																							
24A. IMPLEMENT RECOMMENDATION <input type="checkbox"/> 24B. APPROVE PART <input type="checkbox"/> 24C. DISAPPROVE PART <input type="checkbox"/>																							
25. COMMENTS (Continue on reverse side, if necessary)																							
PROCURING ACTIVITY REPRESENTATIVE (Typed or printed name)								SIGNATURE OF REPRESENTATIVE				DATE											

FIGURE 2b

PREPARATION OF DD FORM 2052 NONSTANDARD PART APPROVAL REQUEST

Contractors will complete Part I only, in accordance with the following instructions, and submit one copy to the activities designated in the contract or purchase order for evaluation and recommendation.

LOG NUMBER: The log number is to be completed as instructed by the Military Parts Control Advisory Group (MPCAG). When adding a part to a Program Parts Selection List (PPSL) For MIL-STD-905, include the Contract Code, Federal Supply Class (FSC) and PPSL Index Number.

- (1) Call the Defense Electronics Supply Center, AC513-296-5445 to obtain the five-digit contract code for the Log Number.
- (2) The PPSL index number for nonstandard parts includes:
 - (a) An alpha prefix to identify prime and subcontractors.
 - (b) A maximum of four digits unique to each PPSL part. Left zero fill. Example: 0001
 - (c) An alpha suffix to identify revisions to a specific part listing index number on later transactions. Leave blank for initial part submissions.
- (3) An example of a log number to add a nonstandard part to the PPSL is as follows:
 Initial request: 00123 5905-A0001
 Revised request: 00123-5905-A0001A

- BLOCK 1:** Enter the prime contract number even when the request is submitted by a subcontractor to the prime contractor.
- BLOCK 2:** Enter the name of the prime contractor on all requests.
- BLOCK 3:** Enter nomenclature and type designation of the prime contract item.
- BLOCK 3A:** Enter the date of the invitation for bid of the contract covering the contractor who is submitting the part request.
- BLOCK 4:** Enter the part procurement document number, if applicable. Leave blank when not applicable.
- BLOCK 5:** When the procurement document is entered in block 4, the entry in block 5 shall be the drawing or specification part number for the part. (Enter the actual part manufacturer's part number in Block 9)
- BLOCK 6:** Enter the FSCM (Federal Supply Code for Manufacturers) associated with the document number and document part number.
- BLOCK 7:** Enter the quantity of parts estimated to be used for each equipment.
- BLOCKS 8, 9 and 10:** Enter the vendor name(s), part number(s) and FSCM(s) of actual manufacturer(s) of the part.
- BLOCK 11:** Check the box which indicates the evaluation requested.
- BLOCK 11A:** Enter the log number of previous requests covering the same part on this contract.
- BLOCK 12:** Upon request, each Military Parts Control Advisory Group (MPCAG) will furnish a list of Description Codes based on standard part descriptions. The Description Code may be entered in block 12 instead of a part description in block 13.
- BLOCK 13:** If a description code is not entered in block 12, enter an alternate name and description in block 13. Block 13 may also be used to supplement the description code.
- BLOCK 14:** Compare the nonstandard part to the standard part whose characteristics are nearest to those required for the application, and give justification for using the nonstandard part (If more space is needed, use reverse side, do not use Block 23)
- Record the date the part procurement must start, and print or type the name of the contractor's representative. Enter date of request and phone number.

PART II is the evaluators' recommendations. All blocks are self-explanatory, except for the following:

- BLOCK 15:** When a part is recommended for approval and the limited application box is checked, the recommendation is limited to the items contracted under the invitation For Bid (IFB) shown in Block 3A. The recommendation shown in Blocks 19A thru E or 20A thru C will apply to additional items procured under this IFB or subsequent IFB's.

PART III is the procuring activity's decision on the contractor's request. The procuring activity shall check off box 24A, B or C as applicable (only one of the boxes shall be checked), and sign and date the form. Under comments, block 25, the procuring activity may specify the kind of part documentation required, test data requirements, limitations and restrictions on the part or any other appropriate information.

ADDITIONAL COMMENTS (Identify with related block number)

DAT
ILMI